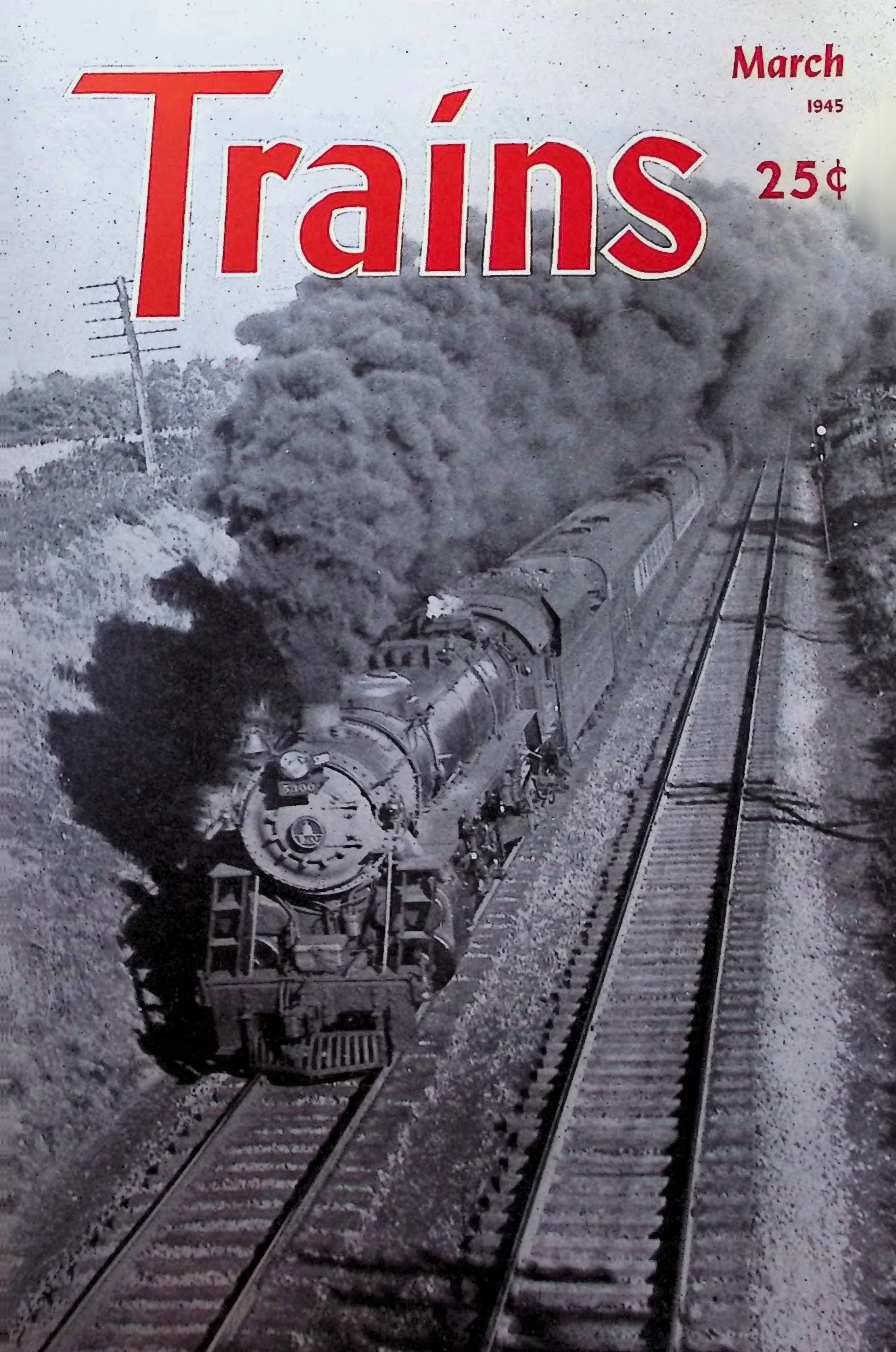
Trains

March
1945

25¢



Another billion dollar highway program

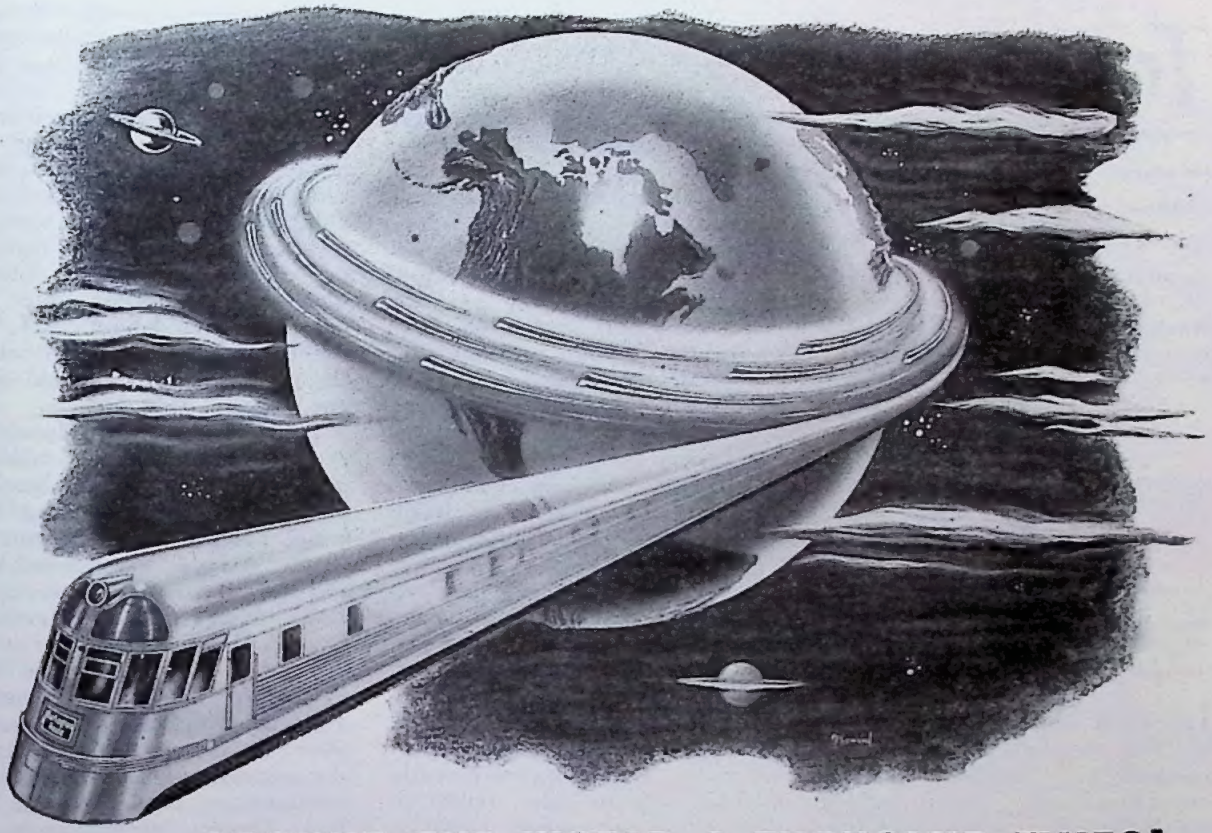
IN thinking about work after the war, don't overlook the 230,000 miles of steel "highways" which the railroads have built and maintain at their own expense. These "highways" provide jobs for more than a quarter of a million men working on construction and maintenance of tracks and roadway — jobs for more than a million other railroad workers — besides still other thousands in the mines, the mills and the forests where roadway materials and supplies are produced.

More than that—the railroads pay real taxes on these "highways," not for their own special benefit, but for the support of schools and other general services, including public highways and streets.

After the last war, between 1920 and 1930, the railroads spent more than four billion dollars for improvements on these "highways," and in addition more than three-and-a-half billion dollars for betterments in equipment. After this war, a similar program will be required.

So there's another highway program which could make a lot of postwar jobs, and which needs no more than a public policy of treating all forms of commercial transportation alike — letting each one pay its own way, which includes the payment of the general taxes upon which governmental services depend.

ASSOCIATION OF
AMERICAN RAILROADS
All United for Victory



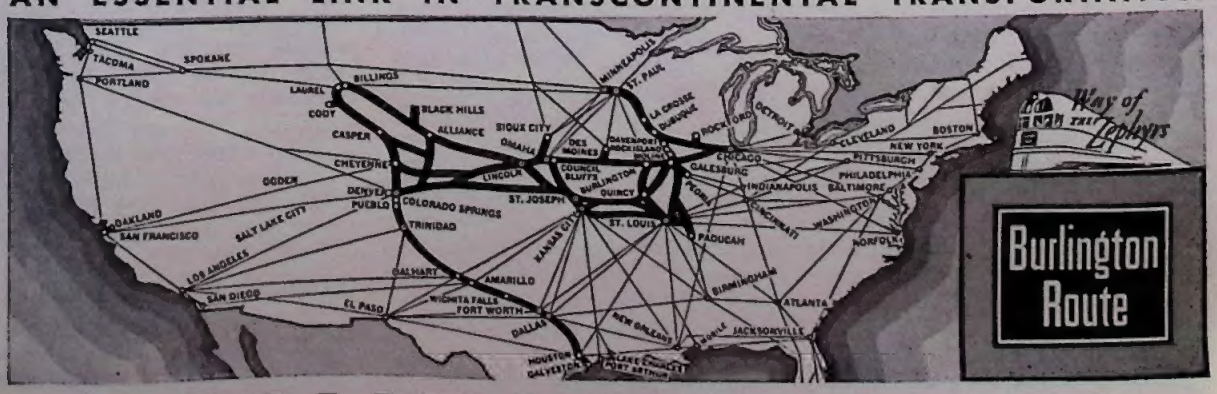
AROUND THE WORLD A THOUSAND TIMES!

• Shortly after the first of this year, Burlington's fleet of fourteen diesel-powered, stainless steel Zephyrs attained an unprecedented total in train miles of service—25,000,000!

In rolling up the equivalent of a thousand times around the world, the Zephyrs have proved many things. Their tremendous patronage has shown the public's enthusiastic endorsement of these speedy, luxurious, streamlined trains. Their almost unbelievable record of availability and "on-time" performance, in the face of high speed schedules, has established the might of diesel power. Their beauty and stamina are a tribute to the design and structural strength of these fast trains. (The Pioneer Zephyr, first of the Zephyr fleet and America's first diesel-powered streamline train, has nearly 2,000,000 miles to its credit and has already started on its second ten years of service.)

Yes, America has given the nod of approval to the Zephyrs and the kind of travel they typify. So there will be more of them in the days ahead. They will be even more efficient, more luxurious. For improvement is the mandate of progress.

AN ESSENTIAL LINK IN TRANSCONTINENTAL TRANSPORTATION



BURLINGTON LINES

Everywhere West

Trains

CONTENT — A. C. Kalmbach
PRESENTATION — Linn H. Westcott
RESEARCH — J. C. O'Hearn
PRODUCTION — Robert J. Fakler
BUSINESS — Henry H. Kirtland

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American railroads produce the world's most efficient common-carrier mass transportation and are the foundation of our country's industrial productivity.

IT TOOK Old Man Winter to do it. For three years of war, the railroads have handled constantly increasing traffic loads without congestion and with practically no car shortages. Last year they moved a record 737 billion ton-miles of freight, about double the peak reached during the last world war. And they did it in spite of losing hundreds of thousands of trained men to the draft, in spite of W.M.C. refusal at first to classify the roads as war industry and hence the loss of new manpower which was funneled elsewhere, and in spite of scanty W. P. B. allottments of new equipment, maintenance materials, and new rail. They did it because of the tremendous efficiency of a physical plant which had been improved during the past 20 years to a far greater extent than was thought possible by outsiders, to whom a locomotive was still a locomotive and a freight car a freight car.

But through the past three war years Old Man Winter went easy. He was saving up, it turned out, for the winter of 1944-45, and when he finally let loose in January, the combined efforts of unusual measures by the O.D.T., the I. C. C., and the A. A. R. were required to avert a virtual blockade of the railroads in the area east and south of the Great Lakes, where snow and cold struck hardest.

Real trouble began at Buffalo on January 2. Nearly 30 inches of snow was on the ground New Year's Day and a thaw and warm rain soaked it into a soggy mass. Then the temperature went down and new snow started to fall, driven by strong winds. Practically every car in Buffalo yards was frozen to the rails, and cars had to be chopped out literally one by one. Thousands of soldiers and sailors from nearby bases were hired, by special permission, to help dig out. Some cars had drifted way above floor level and then frozen solid. As cars were chopped out and yard tracks emptied, spreaders, bulldozers, and plows were put to clearing snow and ice, which had to be loaded and hauled out of the yards. As yards were cleared, more snow fell. By the end of January, Buffalo had had a total of some 90 inches. Cities east in the Mohawk Valley had more. Conditions were nearly as bad as many other points in the central northeastern territory.

New York Central, with its huge mainline operations centered at Buffalo, was worst hit. During the peak of the storm, many mainline trains were annulled east of Cleveland, and for 24 hours only the crack trains such as the *Twentieth Century* and the *Empire State Express* moved through Buffalo. The huge interchange traffic at Buffalo was tied into knots as roads which were little affected by the storms, such as B&O from the south, were able to deliver cars into Buffalo but could not turn them over to other lines. This congestion backed up to other interchange points.

On January 22, the A. A. R. Car Service Division issued a seven-day embargo affecting the movement of most civilian freight into the area east of the Alton Railroad and the Mississippi River and north of the Ohio and Potomac. This was superseded on January 27 by a more stringent three-day embargo on all except certain specified types of military shipments.

At the same time the I. C. C. gave permission to reroute freight as necessary, even if contrary to the shippers' instruction, and the O. D. T. ordered cancelling of passenger trains where necessary to use the locomotives and crews to move freight, especially empty cars back toward loading territory.

Rerouting extended even to extensive diversion of east and west traffic over the C&O, which is entirely south of the affected area. C&O also leased 20 temporarily surplus locomotives to roads in the congested area, and detoured some north and south traffic over its more roundabout route between Richmond and Washington to relieve the crowded direct line.

The Pennsylvania revised its mainline passenger train makeups, cutting off Pullman cars here and adding them there, making some trains all-Pullman and others all-coach, in order to equalize loads and thus load all trains to the 11-car limit of one K-4 and so save double-heading. Service to the public is virtually the same as before but with somewhat different departure and arrival times for certain cars. Some 40 locomotives are thus being saved for movement of war freight. New York Central suspended a few passenger schedules so that more attention could be given to freight. Second sections of some mainline trains were operated in place of following trains.

By the end of January, definite progress had been made, but freight congestion remained serious and how soon freight movements got back to normal depended upon Old Man Winter.

New Equipment in 1944

Class 1 railroads during 1944 put 40,392 new freight cars and 938 new locomotives in service, the A. A. R. announces. This was 11,684 cars and 165 locomotives more than in 1943. In 1942, the railroads put 63,009 new freight cars and 712 new locomotives in service. The new locomotives installed in 1944 include 329 steam, 1 electric, and 608 Diesel. Most new cars were box and hopper.

Baldwin Road Diesel

The first road Diesel locomotive built by Baldwin is a 2000-horsepower passenger unit, now receiving extensive workout on various roads. It went into trial service on the Baltimore & Ohio January 16, and tests were made in both local and express service.

After 10 days it went back to Baldwin for adjustments, and then went south to the Atlantic Coast Line for workouts between Jacksonville and Richmond. Its general appearance is not unlike the Electro-Motive and Alco Diesels. A second unit is nearing completion, and when coupled the two will form a 4000-horsepower locomotive.

Slow Mail?

The Census Bureau, according to the Washington (D. C.) Daily News, recently air-mailed 36 pounds of material for the agricultural census to a supervisor at Salisbury, N. C., at a cost of $46.56. The package went by train because the airlines were grounded but even under ordinary conditions, train mail is as fast as air mail to Salisbury!

Passenger Service Cut

The O. D. T. has ordered that all passenger trains which handled less than a 35 per cent load last November must be discontinued. And, although passenger schedules have been practically frozen since the beginning of the war, it has ordered discontinuance of all special services to resorts. Rumors persist that diners will be ordered off all runs of less than 350 miles, but as yet nothing has been done along this line.

Odds and Ends

The Rock Island will install automatic block signals on 486 miles of line between Albright, Neb., and Limon, Colo. This is the main line to Denver and Colorado Springs and with laying of heavier rail and new ballast in recent years is handling heavy, high-speed traffic. Not since the Rock Island itself block-signaled 339 miles between Pratt, Kan., and Tucumcari, N. Mex., in 1938 has there been a block-signaling project of such magnitude. . . . The coach yards and shops of the Rock Island in Chicago, where all general repairs of passenger equipment are made for the entire 8000-mile system, are being completely rebuilt and rearranged. . . . The B&O has issued a handsome brochure telling the story of B&O coals, emphasizing the vital role of coal in the wartime and postwar economy. . . . Seven and one-tenth miles, three routes, of downtown trolley subways have been proposed as a postwar plan to relieve traffic congestion in Washington, D. C.

The 20 new coaches and 4 dining cars under construction for the L&N will be in a new color scheme, bright aluminum fluted side panels with letterboards and other trim in royal blue. . . . Canadian National Diesel locomotive No. 9000 is back in railroad service. It was on the secret list since the start of the war, having been remodeled for use in an armored train assigned to British Columbia during the Japanese invasion threat. Locomotive and cars looked so much alike it was almost impossible to tell them apart.

The per diem charge which a railroad pays for the use of another railroad's freight cars was raised from $1 to $1.15 on February 1. A protest to the I. C. C. by the Short Line Association, most of whose members use other road's cars far more than they use their own, is pending. . . . Five more 4-8-8-4 "Big Boy" locomotives have been delivered to Union Pacific by American Locomotive, making a total of 25 in service. They are used between Ogden and Green River, hauling 3500 tons without helpers on a ruling grade of 1.14 per cent. The first of this class was delivered in September, 1941. . . . Only two of the first 110 requests to hold group meetings with attendance of more than 50 persons have been approved by the War Committee on Conventions. These were for Red Cross and the United War Fund of North Carolina.

Two new C. T. C. signaling projects are announced, 47 miles on the Milwaukee Road in Minnesota and 44 miles on the C&O in Virginia. . . . Passenger train service has been inaugurated between Paris and Cherbourg for the first time since before D day. One train each way now makes the run in 11 hours 50 minutes. Before the war, special boat trains made the run in 4 hours 45 minutes and regular schedule was about 5¼ hours, according to *Railway Age*. . . . Railway Express last year handled more than 200 million shipments, largest traffic in its history. . . . The Jersey Central is equipping its suburban trains with head-end lighting. Some 60 locomotives are being fitted with large capacity generators, mounted on the tenders, and 300 coaches will have wiring connections so the locomotive generator can light an entire train, thus doing away with fluctuations in lighting caused by the difficulties of keeping batteries charged on short runs and by the axle-driven generators cutting in and out as speed changes. The work may take several years to complete. . . . The Barre & Chelsea [TRAINS, September, 1941], small granite-carrying road in Vermont, has purchased the much larger Montpelier & Wells River [TRAINS, November, 1941]. Both roads were formerly owned by Boston & Maine.

A. C. Kalmbach.

March, 1945 Volume 5 Number 5

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The B&O's Capital Limited near Havre de Grace, Md.
From the forthcoming book, "Highball," by Lucius Beebe.

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Whistles

BY J. C. O'HEARN

Courtesy Norfolk & West

THE locomotive whistle is probably the first thing a child establishes in his mind as being the best way to imitate a train. Those who have developed an analytical interest in railroads are ready to acknowledge that the sound of a locomotive whistle arouses a singularly fascinating emotion. In 1930, the Camden *Courier* printed an item which eulogizes the locomotive whistle and its effect upon the listener. Said the *Courier*:

"The railroad whistle is in a class by itself. It is one of the most romantic sounds one ever hears. To lie in bed, late at night, and hear some distant flyer whistling for a crossing, is to experience the feeling that one has heard the eerie horns of elfland blowing beyond the horizon. The note is haunting beyond words, with an insistent melancholy that defies description. We should be sorry to be deprived of it."

The first steam locomotive whistle came into being as the result of an accident. The Stockton & Darlington Railroad in England, the first passenger railroad in the world (1825), originally employed a man on horseback to precede its train and warn people of its approach. Soon, however, trains were running 15 and more miles an hour, and horses could not keep up with them. Consequently, the mounted escort was discharged. Accidents and near-accidents occurred, but no action was taken until 1828, when a train collided with a farmer's wagon which contained 50 pounds of butter and 80 dozen eggs. That started something.

The directors of the railroad called a meeting to decide what could be used as a warning signal. George Stephenson, who had designed the locomotive, suggested a steam whistle. A maker of musical instruments constructed it, a trumpet about 18″ long and 6″ across the bell. It had what has been described as a "weird and shrieking" tone.

Before standardization of railroad equipment, it was common practice for an engineer assigned to one locomotive to purchase his own chime whistle. Often he would pay from two weeks' to a month's salary for his whistle and thereafter both he and his locomotive were known from one end of his run to the other. Even today it is not unusual to be able to tell what locomotive is hauling a train a mile or so away merely by the tone of that particular engine whistle. Engineers are recognized from the way they handle the whistle cord.

Many types of whistles, chimes or horns have been used by various railroads in the past. The latest trend is toward the powerful air horn.

"The sound of the whistle should be distinct, with intensity and duration proportionate to the distance the signal is to be conveyed." So states the standard code of operating rules issued by the Association of American Railroads. The code is in general use on all railroads in the United States, though many lines have modified the actual signals adopted by the A. A. R.

One such modification resulted in a controversy which lasted a number of years and caused many discussions in newspapers and railroad journals. The A. A. R. code for a grade-crossing signal was two long and two short blasts. Engineers usually modified this by giving two long, a short and a long. Residents along rights of way objected to the long-drawn last call. In 1917, Allen H. Babcock, then consulting engineer for the Southern Pacific, commented on the letters published in newspapers protesting the signal. He pointed out: "The very fact that the modified form signal tends toward a prolonged last blast indicates some operating reason, and hence that possibly an authorized modification of the standard crossing signal in this direction might produce better compliance with the rule than an attempt by discipline to drive enginemen away from a procedure that apparently is based on some ground more potent than the book of rules."

Some years later the signal was changed to the one now used: two longs, a short and a long.

Some municipalities have laws prohibiting locomotive whistle blowing. In one case, authorities established the rule and the railroad complied. Less than a week later, an automobile containing two people was hit by a train roaring through town without whistling at any of the many crossings. The restriction was lifted almost immediately.

While the grade-crossing signal is probably the most widely recognized, many other whistle signals are used by railroads. Conductors signal to the engineer by means of the train communication line, operating a valve which causes a small air whistle to operate in the engine cab. You'll find it interesting diversion to listen for conductor-to-engineer messages on your next trip. When you hear widely spaced hisses of air which denote use of the communication system, listen for the acknowledgement on the locomotive whistle. The most common signal sent over the communication system, especially today, is the three short hisses meaning "Stop at next passenger station." Three short toots from the locomotive mean that the order has been received.

The locomotive whistle in use today is vastly improved over the first one built by Stephenson. It has become a sound-symbol of safe railroading everywhere. As in the early days, its warning call is heeded with alacrity but now it scares more automobiles than wagons away from grade crossings. We concur with the Camden *Courier's* sentiment. We should be sorry to be deprived of it.

Whistle signals

The signals prescribed are illustrated by "o" for short sounds; "—" for longer sounds. This is Rule 14 from the A. A. R. standard code.

o Apply brakes. Stop.

— — Release brakes. Proceed.

— o o o Flagman protect rear of train.

— — — — Flagman may return from west or south.§

— — — — — Flagman may return from east or north.§

o o Answer to any signal not otherwise provided for.

o o o When standing, back; when running, stop at next station.

o o o o Call for signals.

— o o (*Single track.*) To call attention of engine and train crews of trains of the same class, inferior trains and yard engines, and of trains at train-order meeting points, to signals displayed for a following section. If not answered by a train, the train displaying signals must stop and ascertain the cause.

— o o (*Two or more tracks.*) To call attention of engine and train crews of trains of the same class and of inferior trains moving in the same direction and of yard engines, to signals displayed for a following section.

— — o — Approaching public crossings at grade. To be prolonged or repeated until crossing is reached.

———— (very long) Approaching stations, junctions, railroad crossings at grade and where otherwise required.

— — o Approaching meeting or waiting points. (To be sounded one mile before meeting or waiting point.)

o — Inspect train line for leak or for brakes sticking.

o o o o o o Alarm for persons or live stock on track. (This is a succession of short blasts, no given number of signals.)

— o When running against the current of traffic: (1) Approaching stations, curves, or other points where view may be obstructed. (2) Approaching passenger or freight trains and when passing freight trains. (3) Preceding the flagman recall signals.

— — — — — o Flagman may return from east or north on _____ track.§

— — — — o Flagman may return from west or south on _____ track.§

— — — — — o o Flagman may return from east or north on _____ track.§

— — — — o o Flagman may return from west or south on _____ track.§

— — — — — o o o Flagman may return from east or north on _____ track.§

— — — — o o o Flagman may return from west or south on _____ track.§

§ As prescribed by Rule 99.

Communicating Signals.

o o When standing, start.

o o When running, stop at once.

o o o When standing, back.

o o o When running, stop at next passenger station.

o o o o When standing, apply or release air brakes.

o o o o When running, reduce speed.

o o o o o When standing, recall flagman.

o o o o o When running, increase speed.

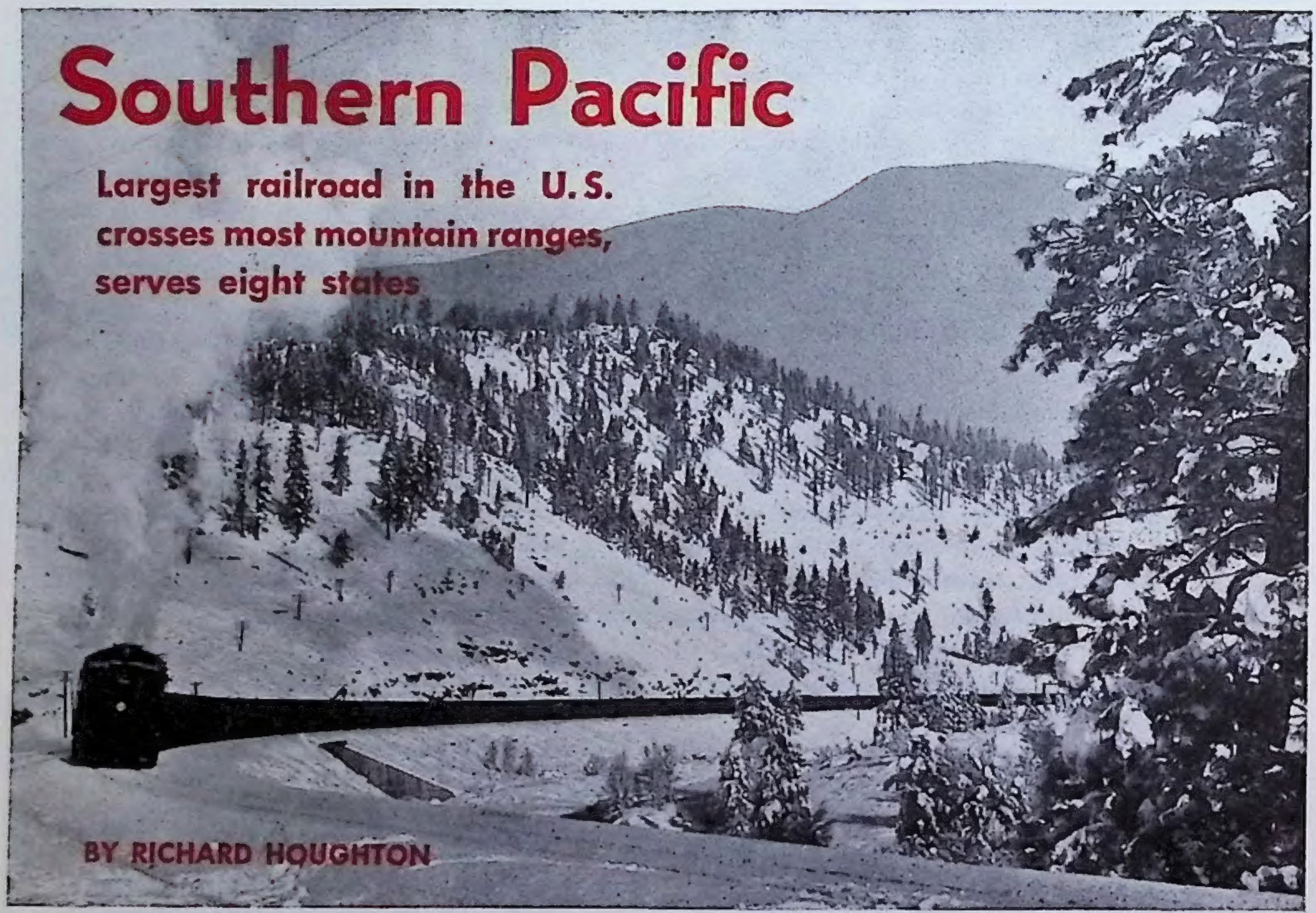
o o o o o o When running, increase train heat.

o — o Shut off train heat.

———— When running, brakes sticking; look back for hand signals.

Southern Pacific

Largest railroad in the U.S. crosses most mountain ranges, serves eight states



BY RICHARD HOUGHTON

Southern Pacific.

STRETCHING its steel rails through rich but sparsely settled farm empires, and also serving war-born industries in the West and Southwest, the Southern Pacific tames the great American desert and crosses more mountain summits than any other railroad in the United States. Outside Canada it is the longest railroad in North America. Its 15,272 miles of main and branch lines extend one-third of the way around the United States. Its Sunset Route crosses two thirds of the continent.

Southern Pacific rails run from Guadalajara, Mexico, to Portland, Ore., more than 2800 miles —the longest north-and-south line on the continent. In freight and passenger volume, SP is the third largest railroad in the United States, only the Pennsylvania and New York Central carry a bigger load.

Southern Pacific is mostly single track, except on much of its Overland Route and near the ports it serves on the Gulf and Pacific coasts. This single track has created a terrific dispatching problem in the past four years, with war requiring a closer and closer parade of trains, carrying all-time record-shattering loads, each year heavier than the one preceding.

This railroad began extensive installation of automatic block signals in 1901, and today has a total of 4825 road miles so equipped on its Pacific Lines alone—more mileage than any other railroad in the United States. In addition, the tight spots have been eased with installations of the new widely popular C. T. C. signals for a total distance of 262 road miles completed or under way on these same lines. On Southern Pacific it has become common for trains under this centralized traffic control to pass at sidings with neither train coming to a halt.

Developed and perfected on Southern Pacific mountain track were the cab-ahead articulated steam locomotives now pulling SP's victory trains over this western warpath. These 6000-horsepower giants give the enginemen a better view ahead on curving track and better protection against engine gases in long tunnels. These locomotives are possible because, like most other SP motive power, they burn fuel oil, which can be controlled by valves at the front end of the boiler.

The records also show that SP built the first all-steel passenger coach, led in providing refrigerator car service for movement of perish-

able shipments, was the first to operate merchandise trains on passenger train schedules, and was a pioneer in store-door pickup and delivery service through coordinated train and truck operation.

So large is SP that it has divided its steam railroad lines into three main parts for easier operation. Its steamship lines were sold in 1941 to the federal government, and its electric lines are all operated separately.

One part of the steam system is Sud Pacifico de Mexico, extending almost 1100 miles from the Arizona border to Guadalajara, Mexico. Interrupted by the revolutionary period, construction was completed in 1927.

Another part of the steam system is the Texas & New Orleans Railroad, whose 4340 miles are wholly owned by SP and connect with it at El Paso to extend SP train service to San Antonio, Dallas, Houston, Galveston and New Orleans. In direct charge of this railroad is H. M. Lull, executive vice-president of the parent company, with his headquarters at Houston. Unlike Sud Pacifico de Mexico, the financial statement of T&NO is consolidated with the third and major unit of the SP system, known as Pacific Lines.

Pacific Lines comprises 8263 miles in Oregon, California, Nevada, Utah, Arizona and New Mexico, with a few miles in Texas to El Paso. Pacific Lines alone is so huge that for operating purposes it is subdivided into 10 divisions with a total of 70,000 employees and a head office in San Francisco where 5000 employees work in the largest office building in the world devoted solely to the business of one railroad. President is A. T. Mercier, who, like most of the top men of Southern Pacific, started near the bottom.

The Southern Pacific Company also has several subsidiary steam rail lines, the two largest being Northwestern Pacific Railroad Company, operating 331 miles through the famous Redwood Empire of northern California, and the San Diego & Arizona Eastern Railway Company, connecting its 184 miles with Southern Pacific at El Centro, Calif., for operation to San Diego and 44 miles in Mexico.

Interesting as the various other parts of Southern Pacific Company are, limitations of space will confine our present attention mostly to lines west of El Paso, Tex.

Pacific Lines was born as the Central Pacific in Sacramento, Calif., in 1861, although it later absorbed some western rail units of slightly greater age. Central Pacific was created by four merchants who were persuaded by an enthusiastic young civil engineer, Theodore D. Judah, to organize financial backing for him in his dream of a transcontinental railroad. The Big Four, as they came to be known, were Collis P. Huntington, Leland Stanford, Charles Crocker and Mark Hopkins, none of whom had previous railroad experience.

Assisted by thousands of imported Chinese coolies (most white men were then too busy digging for gold), construction forces under Crocker pushed the roadbed over the Sierra Nevada Mountains at a summit elevation approximating 7000 feet, sometimes through granite tunnels which black powder blasts could lengthen only seven inches a day. This first railroad over the seemingly impassable mountains was built without aid of power tools or even dynamite. It was opposed bitterly by stagecoach and steamship interests, who feared its competition.

The railroad builders counteracted terrific storms by erecting 40 miles of snow sheds over

Capt. Alex L. H. Darragh.

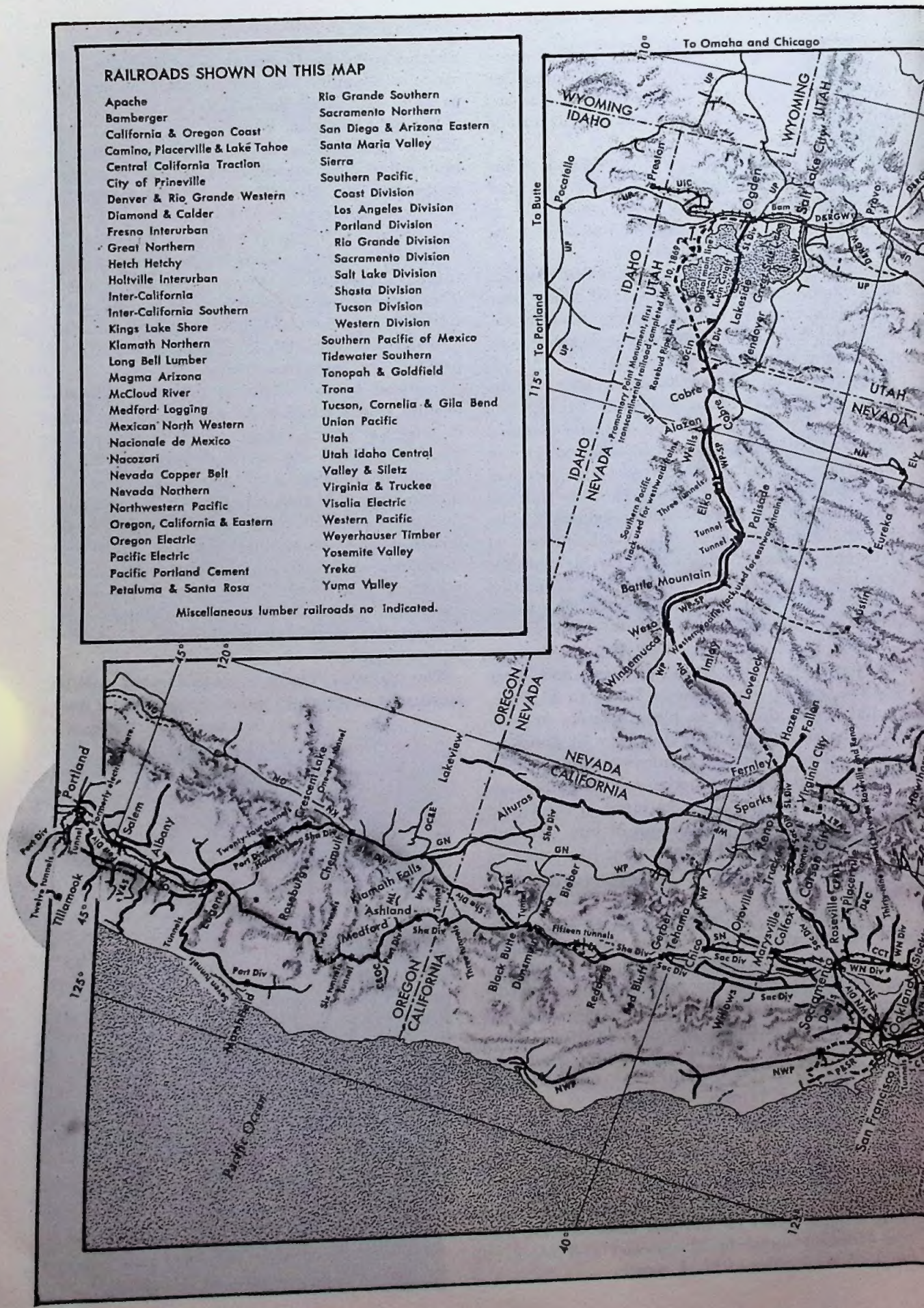
Characteristic of Southern Pacific are these lower-quadrant semaphore block signals, the upper blade being a home signal for the next block and the lower arm a distant signal for the second next block. SP has 4825 road miles of block signals.

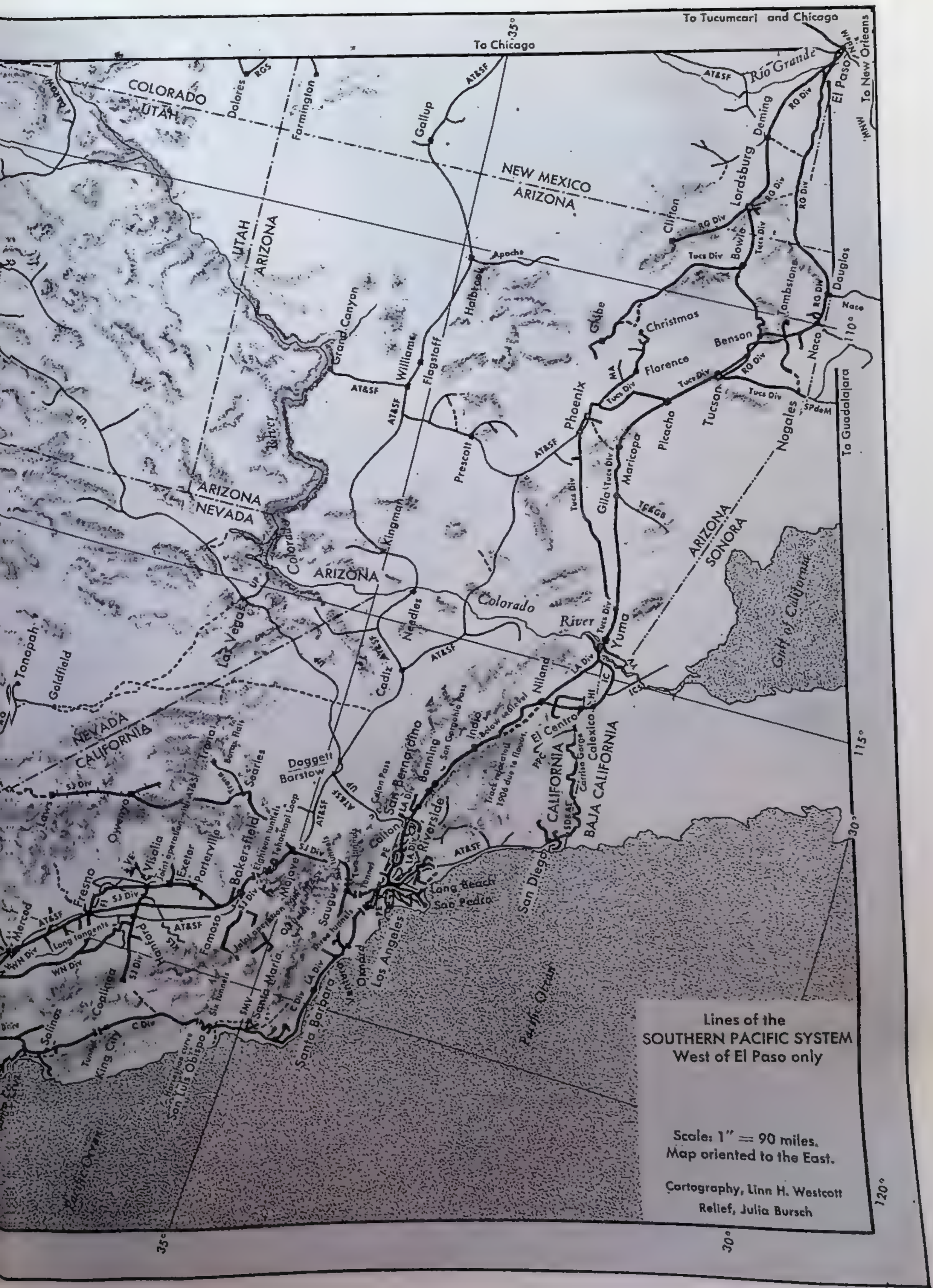
RAILROADS SHOWN ON THIS MAP

Apache
Bamberger
California & Oregon Coast
Camino, Placerville & Lake Tahoe
Central California Traction
City of Prineville
Denver & Rio Grande Western
Diamond & Calder
Fresno Interurban
Great Northern
Hetch Hetchy
Holtville Interurban
Inter-California
Inter-California Southern
Kings Lake Shore
Klamath Northern
Long Bell Lumber
Magma Arizona
McCloud River
Medford Logging
Mexican North Western
Nacionale de Mexico
Nacozari
Nevada Copper Belt
Nevada Northern
Northwestern Pacific
Oregon, California & Eastern
Oregon Electric
Pacific Electric
Pacific Portland Cement
Petaluma & Santa Rosa
Rio Grande Southern
Sacramento Northern
San Diego & Arizona Eastern
Santa Maria Valley
Sierra
Southern Pacific
- Coast Division
- Los Angeles Division
- Portland Division
- Rio Grande Division
- Sacramento Division
- Salt Lake Division
- Shasta Division
- Tucson Division
- Western Division

Southern Pacific of Mexico
Tidewater Southern
Tonopah & Goldfield
Trona
Tucson, Cornelia & Gila Bend
Union Pacific
Utah
Utah Idaho Central
Valley & Siletz
Virginia & Truckee
Visalia Electric
Western Pacific
Weyerhauser Timber
Yosemite Valley
Yreka
Yuma Valley

Miscellaneous lumber railroads no indicated.




To Tucumcari and Chicago
To Chicago
35°
To New Orleans
COLORADO
UTAH
Dolores
RGS
Farmington
Gallup
AT&SF
Rio Grande
El Paso
Deming
RG Div
NEW MEXICO
ARIZONA
Lordsburg
Clifton
Bowie
Tucs Div
Tombstone
Douglas
Apache
UTAH
ARIZONA
Grand Canyon
Williams
Flagstaff
Holbrook
Globe
Christmas
Benson
Naco
Nace
110°
Florence
Tucson
Nogales
SPdeM
To Guadalajara
Phoenix
Prescott
Picacho
Maricopa
Gila
TF&GB
ARIZONA
NEVADA
Kingman
Colorado
ARIZONA
SONORA
Needles
Colorado
River
Yuma
Vegas
Tonopah
Goldfield
Cadiz
Niland
Indio
El Centro
Calexico
CALIFORNIA
BAJA CALIFORNIA
NEVADA
CALIFORNIA
Doggett
Barstow
San Bernardino
Banning
Riverside
Colton
Saugus
Mojave
Bakersfield
Fresno
Visalia
Exeter
Porterville
Owenyo
Soares
Trona
Long Beach
San Pedro
San Diego
Los Angeles
Oxnard
Santa Barbara
Santa Maria
Guadalupe
Lompoc
Hanford
Famoso
Coalinga
Salinas
King City
San Luis Obispo
Merced
Pacific Ocean
Gulf of California
115°
30°
120°
35°
30°
Lines of the
SOUTHERN PACIFIC SYSTEM
West of El Paso only
Scale: 1" = 90 miles.
Map oriented to the East.
Cartography, Linn H. Westcott
Relief, Julia Bursch

H. H. Holton, 121 E. Kendall St., Corona, Calif.

On its mainline crossing of the Sierra Nevadas through Donner Pass, SP is faced with an average of 409 inches of snow per winter. Snow sheds are the best protection against it.

the track to hold back the 40-foot covering of snow that fell in one of the construction winters. The average annual snowfall for the past 47 years has been 409 inches, and the story of SP's fight against it would require a volume in itself.

First trains were pulled by wood-burning locomotives, and sometimes seven or eight of these light engines would line up behind a single bucker plow to push snow off the track. Today, although SP uses rotary snowplows pushed by its largest locomotives and cutting a path 17 feet wide by means of wings and whirling blades, the railroad still has 8.16 miles of snow sheds over its main line, scattered from Emigrant Gap about 30 miles eastward to Andover. Approximately 50 sheds remain, the longest, at Norden, being about a mile in length.

As a climax to their almost unbelievable construction project, the builders of Central Pacific laid 10 miles of track in a day near Great Salt Lake, Utah, a feat which has never since been equaled even with the help of modern machinery. At Promontory, Utah, they met the westward-advancing track of Union Pacific, and there, on May 10, 1869, the golden spike was driven to complete the first transcontinental railroad. To establish its terminal at Ogden, the Central Pacific later purchased the line which the Union Pacific had constructed from Ogden to the Promontory Point Station.

Eastbound from San Francisco Bay over this Overland Route, even the powerful locomotives of today need helper engines on practically all passenger trains on "The Hill," as the Sierra grade is known, and helpers are cut in on

Out of San Francisco on its Coast Line the SP handles a heavy suburban traffic as far as San Jose, 47 miles. This is one of the many commuter trains which leave San Francisco for points south late in the afternoon.

Warrant Officer Otto J. Brechtelbauer.

Solid trains of California fruit move east over Southern Pacific. This one is being helped up Soledad Canyon (San Joaquin Valley line) north of Los Angeles by a 2-8-0 and a 2-6-0.

F. J. Peterson, 1784 S. New Hampshire, Los Angeles, Calif.

freight trains until they reach the summit. At Sparks, Nev., a locomotive erecting shop and extensive machine shop facilities are maintained to keep the giant articulated Consolidations working at high efficiency. At Sparks, a division point, locomotives are changed.

In the early years of the railroad there were heavy grades and curves north of Great Salt Lake in Utah. The builders realized that in avoiding the lake their trains had to climb 1515 feet higher, go 44 miles farther and introduce over 3900 degrees of curvature more than would be necessary if a road were built straight across the lake. But the lake was 32 feet deep, 32 miles wide, with mud bottom, and sometimes lashed by furious storms. The job of crossing it with track seemed impossible.

E. H. Harriman, who followed the last of the Big Four as head of what had then become the Southern Pacific System, and who linked it temporarily with Union Pacific shortly after the turn of the century, ordered this "impossible" job done. Distant forests equivalent to two miles square were cut down for the 38,256 trestle piles needed, and nearby Hogup Mountain was torn down to make the fills that today extend more than half the way straight across the water. On March 8, 1904, the 103-mile Lucin Cutoff, including this lake section, was opened for traffic at a cost of $8,358,833. The grade reduction effected was from 90 to 20 feet per mile.

Strengthened and improved by Southern Pacific from time to time since then, the fills in the Great Salt Lake are so heavy with rock that the mud of the lake bottom has been dis-

The San Francisco Challengers meet at Wells, Nev., on their maiden trip. This picture was taken from a vestibule of the eastbound train. Characteristic of SP trains is the train number displayed at each side of the smokebox top.

E. W. Bewley, Railroad Photographic Club, 47 Royal St., Allston, Mass.

Southern Pacific.

In 1904, SP opened its Lucin Cutoff straight across Great Salt Lake west of Ogden, saving 44.8 miles of track, 3919 degrees of curvature, and 1515 vertical feet of grades. The 12.9 miles on trestle are now being filled.

placed from under them, and waves now beat futilely under the lash of the sometimes howling winds as air-conditioned trains speed smoothly across, carrying in comfort and safety passengers who admire man's conquest of Nature.

Over this route every third day in each direction, rolling all the way from San Francisco Bay on rail weighing from 110 to 132 pounds per yard, streaks the streamlined Diesel-electric *City of San Francisco,* owned and operated jointly by Southern Pacific, Union Pacific, and Chicago & North Western—spanning the 2260 miles to Chicago at an average speed of almost a mile a minute, elapsed time.

This is an extra-fare train. Other trains scheduled to leave both San Francisco and Chicago daily to cover this route are the *Overland Limited,* the *Challenger* and the *Pacific Limited.* The wartime makeup of these trains includes for the *Overland Limited* a number of standard sleepers, observation sleeper, club dormitory and dining car. The *Challenger* includes tourist sleepers, lounge car, coach, reclining-chair cars and dining car. The *Pacific Limited* consists of standard sleepers, tourist sleeper, reclining-chair cars or coaches, and dining car. All the trains are air-conditioned.

Trains traveling the Overland Route pass through three divisions of the Southern Pacific, and eastbound are delivered to the Union Pacific at Ogden, and later to the Chicago & North Western at Omaha for ultimate arrival at Chicago.

Although the route as described on the timetables is from San Francisco to Chicago, actually the passenger rail service does not reach San Francisco. Eastbound passengers from San Francisco, for example, cross San Francisco Bay on Southern Pacific ferry boats and board their train at Oakland Pier. Eastbound freight cars are taken from San Francisco southward on the peninsula and across an arm of the bay via the Dumbarton railroad bridge in the vicinity of Palo Alto. Thence they may roll northward to Oakland or, more likely, eastward through Niles Canyon, Tracy and Stockton to enter the main Overland Route at Sacramento.

In Sacramento, incidentally, are the largest general shops of Southern Pacific, where entire locomotives have been constructed and where cars are turned out by the hundreds.

At Roseville, 17.7 miles east of Sacramento, Southern Pacific has the largest classification yard west of Omaha. Here the trains are made up for the climb eastward over the Sierra. And here other heavy trains, their wheels smoking from brake action on their long trip westward down the grade, grind to a stop, and the big cab-aheads are detached for servicing at the roundhouse and a quick return to the mountain. Like as not in these busy days, a call is already out for an engine before it comes in.

Freight trains move in four directions out of Roseville: south via Los Angeles to the Sunset and Golden State routes, north to Portland and the Pacific Northwest over the Shasta Route, west to the San Francisco Bay area and central California, and east up the grade and over the Sierra on the Overland Route.

Roseville and the Sierra climb are both in the Sacramento Division, which was headed from 1925 until his recent retirement by W. L. (Bill) Hack, one of the best-known railroad superintendents in the world.

Each of the 10 divisions of Pacific Lines has its own superintendent, who has full responsibility for the operation of the entire division, reporting to the general manager in the general office in San Francisco. Under each superintendent are three coordinate officers of equal rank, each with his respective staff, reporting directly to the superintendent. These are the division engineer in charge of maintenance of way, the master mechanic in charge of power and cars, and the assistant superintendent in charge of operating matters.

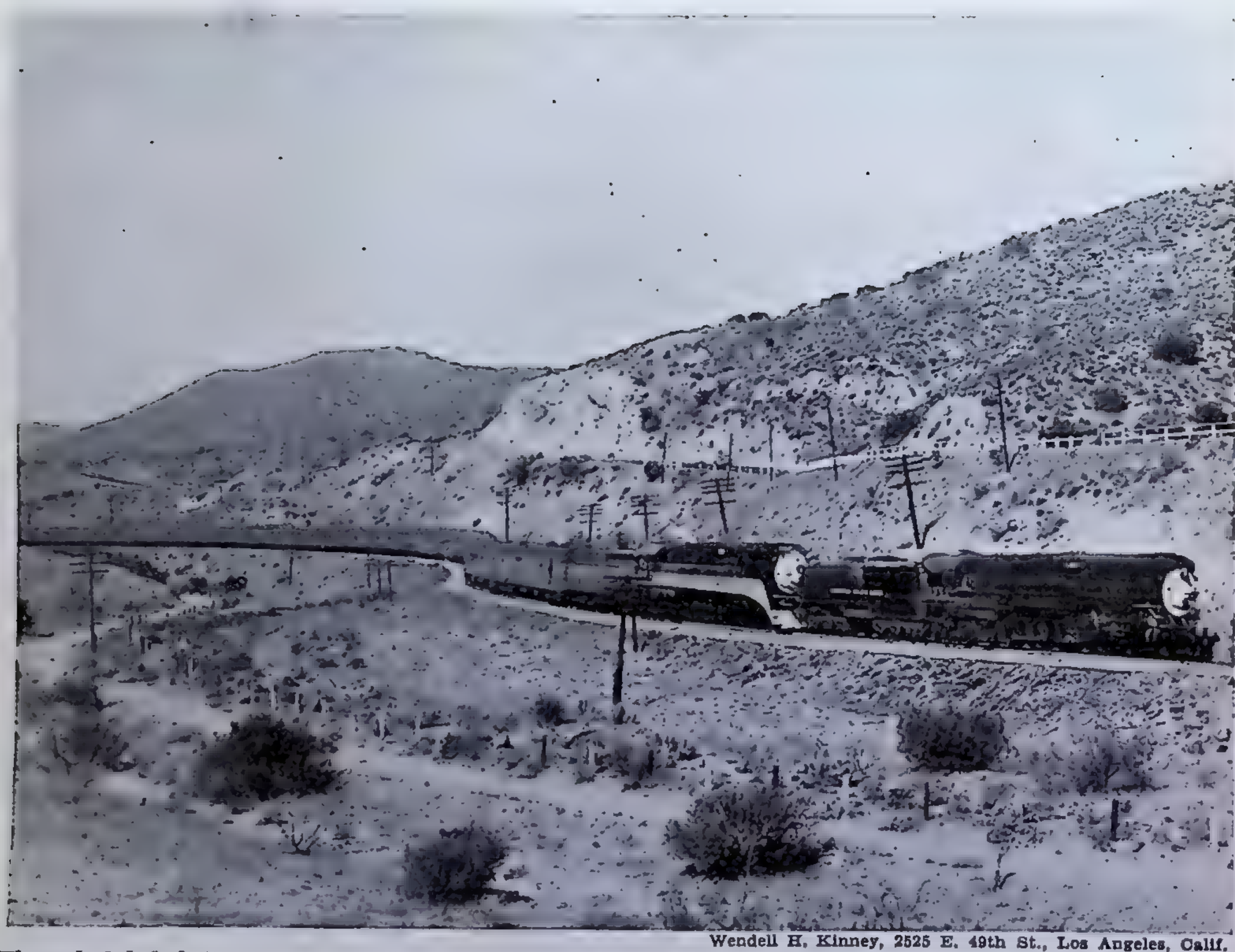
Sacramento Division is one of the toughest divisions of Southern Pacific. The superintendent is responsible for lifting tremendous tonnages over the 7000-foot summit. The gradient from Colfax to Emigrant Gap in this climb is 2.4 per cent. In peace times there was a violent peak load each year, 75,000 cars of perishable commodities from California farms on a definite, guaranteed schedule, reaching a maximum of 1200 cars a day and averaging 750 to 800 cars a day for a period of two months. Freight trains sometimes followed each other eastward at 45-minute intervals, mighty close headway on a mountain railroad. Today they're sometimes closer.

Since war began there has been heavier traffic—exactly how heavy I am not at liberty to say—and the flow westward has become much greater than in peace years, when it was comparatively light. SP therefore has special cause to be thankful that it double-tracked much of this route of the pioneers, and that it has a paired-track agreement with Western Pacific for a considerable portion of the route through Nevada.

So difficult was SP's double-track construc-

Probably a greater diversity of scenery can be viewed from trains on Southern Pacific's Coast Line between Los Angeles and San Francisco than from any other travel route in the Golden State. Mountains, valleys and seacoast are seen from the car windows. The railroad tracks follow the surf line for 131 miles, and one of the most interesting sights on this part of the journey is found at Summerland, where oil wells have been drilled some distance offshore. The photo shows a group of oil rigs on the beach with the SP main line in the foreground.

Southern Pacific.



Wendell H. Kinney, 2525 E. 49th St., Los Angeles, Calif.

Through Soledad Canyon the SP climbs out of the valley at Los Angeles to the summit of the San Gabriel Mountains and across to Mojave. Here is the San Joaquin Daylight, with a Daylight-type engine and a Mountain-type helper, climbing up the canyon on its run to San Francisco.

tion over the Sierra that actually a large part of it consists of two single-track lines following different routes, one for eastbound and the other for westbound traffic. These tracks cross over each other in several places, sometimes giving the appearance of left-hand running of trains.

Abnormal wartime traffic is keeping all motive power busy all the time, but in peace times a surplus of motive power had to be maintained during light-traffic months of the year in order to handle the load during the peak months. Those light-traffic months were devoted to preparations for the peak, and when that peak arrived every locomotive must have undergone necessary repairs, trackwork must have been completed and everyone had to be ready to keep the parade of freight trains rolling up and over the summit.

The ratings of locomotives were obtained during the slack season (there is no slack season now, so I am speaking of this in the past tense), when trains were ridden by the superintendent and the trainmaster, one on the engine and the other in the caboose, to make careful records of the performance of each engine. When the peak season comes—and it still does, but it's more or less continuous—the responsibility of the general yardmaster at Roseville is to see that the eastbound trains are made up so as to leave at the determined close intervals, and that the trains are of such weight that they will move at uniform speed despite the various types of locomotives that must be used.

The opposite way, coming westward downgrade from Norden, it is not a matter of power but of braking. When westbound trains leave the summit the retainers are up. Pulling out of Norden, the speed is eight miles an hour on the 1.8 grade preliminary to the 2.4 grade which begins near Emigrant Gap. At Norden, large, powerful floodlights enable the brakemen to make a thorough rolling inspection at night.

From Norden to the first inspection station is seven miles, in which distance the trainmen watch the brake operation. All stops are not in excess of 10 minutes each, as that is sufficient for a thorough inspection and for heat radiation from the wheels. After a longer stop the wheels might cool to the point of breakage danger.

Because of the rule that trains must stop at each inspection station, SP has established an enviable record of safe running on this tough stretch of track.

When trains run as close together as they do on this mountain railroad in the peak seasons, the problem of feeding the train crews without tying up the mountain is a puzzling one. When headlights get thick on the grade, experience has shown that the maximum traffic density is at Emigrant Gap, because that is where locomotives take water, and where train and engine crews eat. A long siding has been blasted out of the granite here, with an eating-house at each end. Five trains can be held here at a time.

So far we have discussed only the Overland Route, and while it is of primary interest because of its history, other tracks also are spectacular. A total of 182 tunnels on Pacific Lines indicates the difficult terrain that SP serves.

The building of the railroad northward from Sacramento, up the great Sacramento Valley of California, through the Sacramento River Canyon and over the Siskiyou Mountains—part of the Coast Range—to link San Francisco with the Northwest, in some ways rivaled the feat of crossing the Sierra Nevada.

It was in 1869, the year the last spike was driven in the first transcontinental route, that the first spikes were driven both by Oregon and by California builders in what was destined to become the Shasta Route. The Oregon builders gave up after several years and the job was completed by Southern Pacific, with the line opened for through service between Portland and San Francisco Bay, more than 700 miles, on December 17, 1887.

On the Siskiyou line, which for many years was part of the main route of this project, an elevation of 4135 feet was reached after passing through the 3108-foot summit tunnel, the longest of 16 borings through the Siskiyou ridges. It was necessary to lay track on curvatures reaching up to 14 degrees and on a maximum grade of 3.3 per cent. One hundred miles of curved track was built in a distance of 171 miles, in which a total of 31,700 degrees of curvature causes a train to make 88 complete circles in traveling that distance. Between Redding and Ashland, 165 miles, the Sacramento River is crossed 17 times.

To provide an alternate and easier route by-passing the Siskiyou Mountains, the Cascade line was completed in 1926 at a cost of more than 39 million dollars. It reduced the maximum grade between San Francisco and Portland from 174 to 95 feet per mile, reduced the distance 24.9 miles and reduced the total curvature by 18,907 degrees, or about 52 complete circles. Between Oakridge and the summit of the Cascades, on the west slope of the mountains, are 19 tunnels with an aggregate length of 19,993 feet, nearly all bored through rock. On the Cascade line between Cascade summit and Oakridge is a tunnel forming a semicircle in which the road reverses itself, and also on this line is a single-ended tunnel on the tail of a wye for turning helper engines.

Another improvement in the line from California toward the Northwest was made in 1942, when it was necessary to reroute the railroad between Redding and Delta around the site of the projected Shasta Dam reservoir. The new line, approximately 30 miles long, was built at a higher elevation to replace the old line which was to be submerged. The line passed over eight steel bridges with a combined length of more than 2¼ miles and through 12 tunnels totaling more than 3½ miles. A double-deck railroad and highway bridge across the Pit River is more than a half mile long at the railroad deck and 500 feet high from its submerged base. This makes it one of the highest railroad bridges in the world, although when Shasta Dam is full, the tracks near the center of the span will be only 40 feet above the water level.

Over the Shasta Route, in addition to a heavy volume of freight, Southern Pacific operates five through passenger trains daily, the *Cascade, Beaver, Oregonian, Klamath* and *West Coast,* linking San Francisco and Seattle by means of connections at Portland with the Northern Pacific, the Union Pacific, and the Spokane, Portland & Seattle railroads.

The West Coast train and the coordinated Klamath and San Joaquin *Daylight* trains are scheduled all the way between Los Angeles and Seattle. Equipment includes cars ranging from coaches to standard sleepers. The *Cascade* is an all-standard sleeper train with sec-

Pacific Coast Chapter, Railway & Locomotive Historical Society.

This spiffy-looking switch engine shuffles the cars around at the Sacramento station of the SP. Stainless-steel letters and figures, burnished brass and copper, and nickle-plated parts make it a thing of beauty. It is of Class S-12, and, like most SP power, oil-fired.

tions, bedrooms, compartments and drawing rooms. Most popular-priced train is the *Beaver*, carrying tourist sleeping cars, streamlined reclining-chair cars, and, of course, the dining car.

The Northwest was tied more directly into SP's Overland Route by the completion, in September, 1929, of the Modoc line, which takes off from the Cascade line of the Shasta Route at Klamath Falls and stretches southeastward across part of Oregon and California by way of Alturas and Wendel to connect with the Overland Route at Fernley, Nev. This cutoff brought Ore-

F. J. Peterson.

Southern Pacific.

The 4-10-2 (above, right) is known as the "Southern Pacific" type. It has three cylinders with the central piston connected to the central driving axle. The fleet Atlantics (bottom), now becoming rare, were once widely used in light fast passenger service.

P. J. Peterson.

Only Southern Pacific uses the cab-ahead type of locomotive, a unique construction permitted by the use of fuel oil instead of coal. This arrangement gives better visibility, especially important in tunnels and snow sheds where exhaust steam would otherwise obstruct the view. All of these cab-ahead locomotives are articulated, some 4-6-6-2, some 2-8-8-2, and most of them, and the most recent, 4-8-8-2.

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P. J. Peterson.

The brilliant orange, red and black Daylight-type, or General Service, engines are of 4-8-4 wheel arrangement, and are divided into four sub-classes, of which the latest were bought during wartime and painted black and have 73½-inch drivers instead of 80-inch. Older heavy freight power of SP includes the F-4a Santa Fe type (below), built by Baldwin in 1922.

gon and northern California about 200 miles nearer the markets of the East, and practically made a new mail line for this territory.

While Southern Pacific was pioneering its Shasta Route into the Northwest in the late '60's it also was extending its tracks southward from the San Francisco Bay area, and in the 1870's the arm which had reached south into the San Joaquin Valley was continued on over the Tehachapi Mountains toward Los Angeles. In order to climb the Tehachapi

Wendell H. Kinney.

This is one of the most profitable trains in the world: the Daylight over the 470-mile Coast Line between San Francisco and Los Angeles. Before the war it was operated twice daily in both directions. Now only the morning (leaving time) trains are run, as a wartime conservation measure. The Daylights (seen here in Santa Susanna Pass northwest of Los Angeles) took people off the highways and created a large traffic for themselves on a run where the day trains had formerly handled very few through passengers.

Pass (elevation 4025 feet) it was necessary to swerve the rails back and forth up a mountainside through 18 tunnels, at one point looping the track back over itself in a giant circle around a hill. Circling this loop, a long train may find one end of itself directly above the other end, and 77 feet higher. In this clever rise a start is made that eases the grade on its final climb to the summit.

Over this Southern Pacific track, from Bakersfield in the San Joaquin Valley to Mojave in the desert beyond the Tehachapis, Santa Fe trains also roll by agreement with SP. In this heavily traveled territory a long section of C. T. C. track is proving especially valuable.

From Mojave the SP line runs directly south, then turns westward and through the San Fernando Mountains to Los Angeles. Longest tunnel in the mountains is 6976 feet.

Another route between San Francisco and Los Angeles was badly needed, but its construction was not completed and through train service via Santa Barbara and Saugus established until 1901, and shortened by way of Chatsworth in 1904. On this Coast line, midway between California's two main cities, a unique bit of engineering was done after passing through six tunnels in the Santa Lucia Mountains—part of the Coast Range. Dipping southward toward San Luis Obispo, the builders struck a ravine which they had to cross. To go directly across would mean a drop of about 60 feet in 200 yards. Instead, they built an immense horseshoe embankment on a 10-degree curve to keep the track on a grade of 116 feet to the mile. The embankment is about 70 feet high in one place. At this point, travelers in the streamlined *Coast Daylight* coach trains are

advised through the public address system to look out their wide windows of clear safety glass and see their locomotive and rear car directly opposite each other on the loop and moving in opposite directions.

The *Coast Daylight* and its companion night train, the all-Pullman *Lark*, are believed by the railroad to be the finest trains of their kind in the world. The *Daylights*, traveling in both directions, make the dawn-to-dusk flight between San Francisco and Los Angeles every day, and the *Larks* do it from dusk to dawn. Top speed is held down to 75 miles an hour. Before the war there also were *Noon Daylights*, but like a number of other profitable SP trains they had to be removed for the duration to make room for the victory freights and troop trains.

Another pair of *Daylights* travels the valley route, between Oakland and Los Angeles, and are known as the *San Joaquin Daylights*.

The orange-and-red streamlined *Daylights*, with their skirted General Service locomotives, have received nationwide publicity. The *Larks* probably are not so well known. The night fliers feature a three-car articulated unit, pioneered by Southern Pacific, which gives the impression of a single car 204 feet long, as partitions between cars have been removed. Each of these units cost a quarter of a million dollars. The sleeping cars of the *Larks* are mostly made up of rooms, although some section space is offered. Exterior color scheme is two-tone gray with aluminum striping.

Two other daily passenger trains follow the coast route each way, and two others the valley route, giving excellent service between San Francisco and Los Angeles, even during present wartime conditions.

On the Coast Line is the famous Salinas "Salad Bowl" district, which originates a tremendous volume of lettuce for dining tables all over America. This crisp green perishable product of California farms is a mainstay in SP freight business.

At Los Angeles, Southern Pacific uses the $11,000,000 Union Terminal built jointly with Union Pacific and Santa Fe. At Los Angeles, also, is another large general shop, equipped to repair the heaviest of locomotives.

From Los Angeles the railroad extends eastward, through the San Bernardino Mountains, across the yellow, barren country and past the Salton Sea—serving rich Imperial Valley on the way and loading its perishable melons and other crops for the housewives of the nation. Eastward still it goes, through vast stretches of colorful country near the Mexican border.

At Tucson, Ariz., is the connection with the southward-reaching arm of Sud Pacifico de Mexico, and shortly beyond Tucson the eastward track divides into two routes, spreading out to serve the bald painted lands and the mines of New Mexico and coming together again at El Paso in west Texas.

El Paso is a railroad city, with lines radiating from it like seven spokes of a wheel. The first two spokes are the tracks from Tucson. The third and fourth spokes are the lines of the railroads into Mexico, the principal one being the National Railways of Mexico. The fifth spoke is the line eastward along the Rio Grande, used by the T&NO lines of the Southern Pacific System to carry SP trains through San Antonio (the Alamo) and Houston, the largest city in Texas, to romantic New Orleans across the Mississippi on the longest steel bridge used by a steam railroad in the world. The sixth railroad spoke out of El Paso is the Golden State Route of Southern Pacific, reaching northeastward to connect with the Rock Island at Tucumcari for the rest of the way to Chicago. The seventh spoke is the Santa Fe, northwestward.

El Paso is the gateway to Carlsbad Caverns National Park. Southern Pacific, by the way, serves more national parks than any other railroad: Carlsbad Caverns, Crater Lake, Mount Lassen, Sequoia, Kings Canyon, Yosemite. They are not being advertised in these days of crowded trains.

Prize SP passenger trains through El Paso are the *Sunset Limited* and the *Argonaut* on the Sunset Route to New Orleans, and the *Golden State Limited* and the *Californian* on the Golden State Route. These are pulled by General Service locomotives, Lima-built, similar to those used on the West Coast *Daylights* and *Larks*. Much of the other motive power is articulated. Coal-burning articulated locomotives are used on freight trains between El Paso and Tucumcari, and to some extent on the line between El Paso and Lordsburg. Passenger trains and other freights use oil-burning locomotives.

THE West with which Southern Pacific grew up has always been predominantly agricultural, but the war has brought industries in increasing numbers and many of them promise

to remain. There are great new airplane manufacturing plants, shipyards and steel mills such as previously existed only in eastern states. Henry Kaiser's magnesium plants and his world's greatest cement plant near the coast of central California, the growing plywood mills of the Northwest, the plastics and synthetic rubber industries—all bring SP new kinds of freight. Cheap electric power from Shasta Dam is already flowing into the transmission lines that may feed great factories, and in the Southwest is power from Boulder Dam.

In the one year of 1943, the population of California rose 22.6 per cent to 8,446,522, exceeding all states but New York and Pennsylvania. This growth will attract more industry, because it makes available a tremendous reservoir of manpower and a rich new consuming market. The Southwest—in fact, all territory served by Southern Pacific—is sharing in this war-born expansion.

In spite of this new emphasis on industry, the railroad handles a heavier movement of farm products than ever. With the war traffic going full blast on the crowded rails, SP's farmer clients have been called upon to supply greater quantities of foodstuffs than ever before to satisfy greatly increased requirements for lend-lease shipment as well as for domestic and military use. The result was that SP lines in 1943 handled 18 million tons of agricultural, dairy and meat products in their raw and processed states. The 14½ million tons of forest products handled during 1943 also set a new all-time high record for SP shipments of these products.

Secret of SP's popular success in handling perishables probably lies in the fact that individual shippers, no matter how small, are given exactly the same service as the largest. Thus all farmers in the West and Southwest compete on equal footing in distant markets of the East.

When a farmer wants to ship his produce, he notifies the railroad in advance as to what day he will need an empty car, and although he may be far from the main line on some lonely siding, the car will be there when he wants it. The farmer will load it speedily, thanks to nationwide publicity campaigns which have impressed upon him the importance of keeping railroad cars rolling in these critical times.

From the loading point, the car is first hooked onto a special pickup train which hauls it to a large railroad yard called a concentration point. In northern California the cars a tate toward the big yards at Roseville southern California to the yards at C these concentration points the car joins block"—a string of refrigerator cars together. It then starts east, following indicated by the shipper, but it may destination several times if market ac ceived by the shipper while the car is reveals that a different market is mor Arrival at the destination is guarante definite date.

I have mentioned the speedy loading It should also be pointed out that they heavily loaded than in prewar days. ample, cars handled by SP in 1933 26.81 tons, and in 1943, through coope railroads, governmental agencies and this was stepped up to 32.86 tons Heavier loading and speedier handli bined to make an even greater gain. miles per car-day in 1933 were 304, in to 983 in 1943.

To serve the growers of perishabl Southern Pacific and Union Pacific jointly organized the Pacific Fruit Company, which now is owned half by the two railroads and has a fleet than 36,000 refrigerator cars operati practically all railroad lines in the States and Mexico. Extensive refrigera pre-cooling facilities are maintained at points along the lines. The compan largest refrigerator car organization world, measured both by number of car and traffic volume moved.

Besides its half interest in PFE, the S Pacific owns 60,000 freight cars and 1 senger-train cars, as well as 2183 loco SP interchanges freight in carload a than-carload lots with 60 other rail 132 points along its lines. A recent c vealed that approximately 63,000 cars by other roads were rolling on SP tr

In 1943, the net ton-miles of freight per cent greater than in 1939, the last fore defense production affected rail t tation, and 143 per cent over the previ time high of 1929.

In addition to breaking freight rec also is exceeding all its former passen ords, and might be carrying more ex the fact that, since July, 1943, it h operating under a train assignment coach passengers. On all long-distanc

passengers must obtain reservations in advance for coach space. A reservation entitles the passenger to board a certain train but does not assign a specific seat (however, specific seat reservations are still made on the *Daylights*, the *Beaver*, and the *City of San Francisco*). Service men are given preference. As a result of this coach assignment plan, overcrowding of SP trains is prevented, with infrequent exceptions.

In 1943, the passenger load on SP was up 205 per cent over the former all-time peak of 1920. Although unable to increase the number of its dining cars because of wartime restrictions, SP served 10,678,000 meals in its 133 diners and six cafe-lounge cars in 1943, sold 1,623,000 meals in its eight restaurants, and more than 2,000,000 box lunches, besides some 2,000,000 separate sandwiches. SP served more military meals in 1943 than any two other railroads combined, and more meals to civilians than any other line.

P. J. Peterson.

Like most roads, SP has its quota of Consolidations. The 2-8-0 was once the standard freight locomotive of America. The 2601, which was built in 1899 by Schenectady, was originally a cross-compound, a fine road engine. Now is it confined to yard work.

Carl J. Bachmann, P. O. Box 98, Litchfield Park, Ariz.

On Arizona and New Mexico lines, where coal is burned, the cab-ahead engines cannot be used, so a conventional type, but not conventional-looking, articulated was designed. These locomotives are of 2-8-8-4 wheel arrangement and carry out some of the lines of the Daylight engines, which were also built by Lima. The 3804 is shown with a westbound freight near Hargis, N. M., on the Golden State Route.

In the first two years of war the company operated 13,568 special trains for all branches of the armed services, in addition to the more-than-85,000 military cars handled in regular trains. SP serves more military and naval establishments than any other railroad, which explains the extremely heavy military traffic. This heavy military travel complicates the dining car problem because rationing makes it necessary for the railroad to use most of its meat points for the fighting men, and therefore to serve the traveling civilians increasing proportions of fish and poultry. In fact, the railroad finally has warned its patrons not to be alarmed if they start sprouting fins and feathers.

Car and food shortages are further complicated by manpower shortages. More than 16,000 Southern Pacific men and women (enough for more than a full Army division, if they'd all joined the Army) left their jobs and went to the fighting fronts with the various branches of the armed services. In the mechanical departments of SP today the 12-hour shift is the rule as the workers put in overtime to keep the trains rolling. They have done so well that equipment out of service for repairs was kept at an average all-time low last year. Many veteran workers have stayed on their jobs past the time they were eligible to retire on pensions. Approximately 4000 women are doing SP jobs formerly performed only by men. And a recent report showed that more than 9000 Mexican nationals were working on track maintenance crews as their part in keeping the SP trains on schedule.

Southern Pacific prides itself on the fact that despite its huge debt, which it gradually is whittling down, it has never defaulted on a financial obligation. In 1908 it repaid in full to

the federal government the last of Central Pacific's debt of $58,813,000, incurred in building the first transcontinental line. SP estimates that the original value of land grants made by the government to encourage railroad pioneering through the western wilderness has been repaid several times over by the railroad rate reductions given on government traffic.

Whittling down the debt has not been at the expense of investment in better railroading. In the four years since December 31, 1939, the company expended throughout its lines more than 131 million dollars on improvements. In its physical plant it is putting emphasis on larger locomotives, with an average increase of 15 per cent in fuel efficiency in the decade just prior to the war. In those years Southern Pacific purchased 308 steam and Diesel engines, among them one order for 20 of the giant articulated Consolidation-type cab-ahead locomotives. SP now has 243 articulated Consolidations (not all of them cab-aheads). Another modern, heavy engine is the General Service type, of which there are 74. Also typical of SP is its own "Southern Pacific type" 4-10-2, which has three cylinders, one acting on a crank on the second driving axle. The addition of so many heavy locomotives accounts in large part for the fact that the tractive effort of the average SP locomotive has increased 61 per cent since 1918.

Southern Pacific has advanced far in public esteem since its early days. The railroaders always knew that their prosperity was tied up with the prosperity of the western people. And in 1906, when the great earthquake and fire struck San Francisco, the railroad proved it had a heart. Some 1600 carloads of relief supplies and over 224,000 passengers were carried free.

Again, early in 1907, the railroad was called upon by the federal government to control the Colorado River, which had broken through its banks and was pouring into Imperial Valley. The SP hauled and dumped rock faster than it had ever been hauled and dumped before, damming the torrent and saving one of the richest agricultural areas of the United States.

Southern Pacific.

West end of the line for the Overland Route is the Oakland Mole across the bay from San Francisco. Freight cars are moved around the bay and directly into the city of St. Francis, but passengers leave trains under the huge trainshed on the mole and change to ferry boats for the trip over the bay. They are landed in San Francisco at the ferry house at the foot of Market Street. This picture was taken before the bay bridge was built, and so the SP's multiple-unit suburban trains can be seen in the background.

Yes, Southern Pacific has served the West well. It lives its slogan, "The Friendly Railroad." And it promises even better service to come. President Mercier has announced that when the war is over SP will continue its development of streamlined trains, will restore the fleet of fast overnight merchandise freights, and will expand all its popular services to match the public demand.

Dreams of Empire

BY WILLIAM FORSYTHE

No longer may you merely dream a railroad, then build it; now you must have I. C. C. permission

WANT to build your own railroad? And then run it? You could be its president, or maybe even chairman of the board. Well, there have been many such would-be executives.

It used to be that you needed only to decide where your line was to run and then go out and get the money to start building. But it's different now. Mere desire isn't enough. And the change is all to the good.

Lines built now will serve definite community needs; they will be amply and properly financed; almost surely they will prosper; and with all this, they won't starve existing lines that might be in straits even without the added competition.

It was in 1920 that Convenience and Necessity were first written into federal law, as part of that year's epochal Transportation Act. Now, as Paragraph 18 of Section One of the Interstate Commerce Act, it provides that before a railroad can build a new line or extend its lines, a certificate must be obtained from the Interstate Commerce Commission to the effect that public convenience and necessity warrant the construction.

Since 1920, many small extension, spur and connecting tracks have been built, as well as terminal properties—in every case, after certificate issuance. Comparatively few lines of substantial nationwide importance have been added to total mileage. Vast numbers of cases were denied for one reason or another. Naivete, wild optimism and just plain foolishness were apparent in numerous applications filed under Convenience and Necessity. One notable exception was L. F. Loree's New York, Pittsburgh & Chicago Railroad [June 1943 TRAINS].

Mr. Loree, already one of the nation's eminent railroad managers, knew how to build a railroad, find traffic to support it, and operate it. And we can believe he and his associates could have raised the money required for construction. These days, all carriers handle business in unheard-of amounts; had Loree been granted permission to build, it might be that by now everyone would be glad of it.

Roy Greene's proposal, described later, did have as its foundation a serious and far-sighted study of the nation's transportation needs, even though the study had been made decades before, and by someone else. But timing and general character of the Greene fiasco win it the leather medal for foolishness.

Read now about five of the big railroad construction projects turned down by the Commission since 1920. All material comes from official reports of the Commission. These cases were selected as extreme examples to show how a fantastic foundation of sand can be called hard rock when a promoter gets that wild look in his eye.

Colorado, Columbus & Mexican Railroad

Decided December 10, 1923

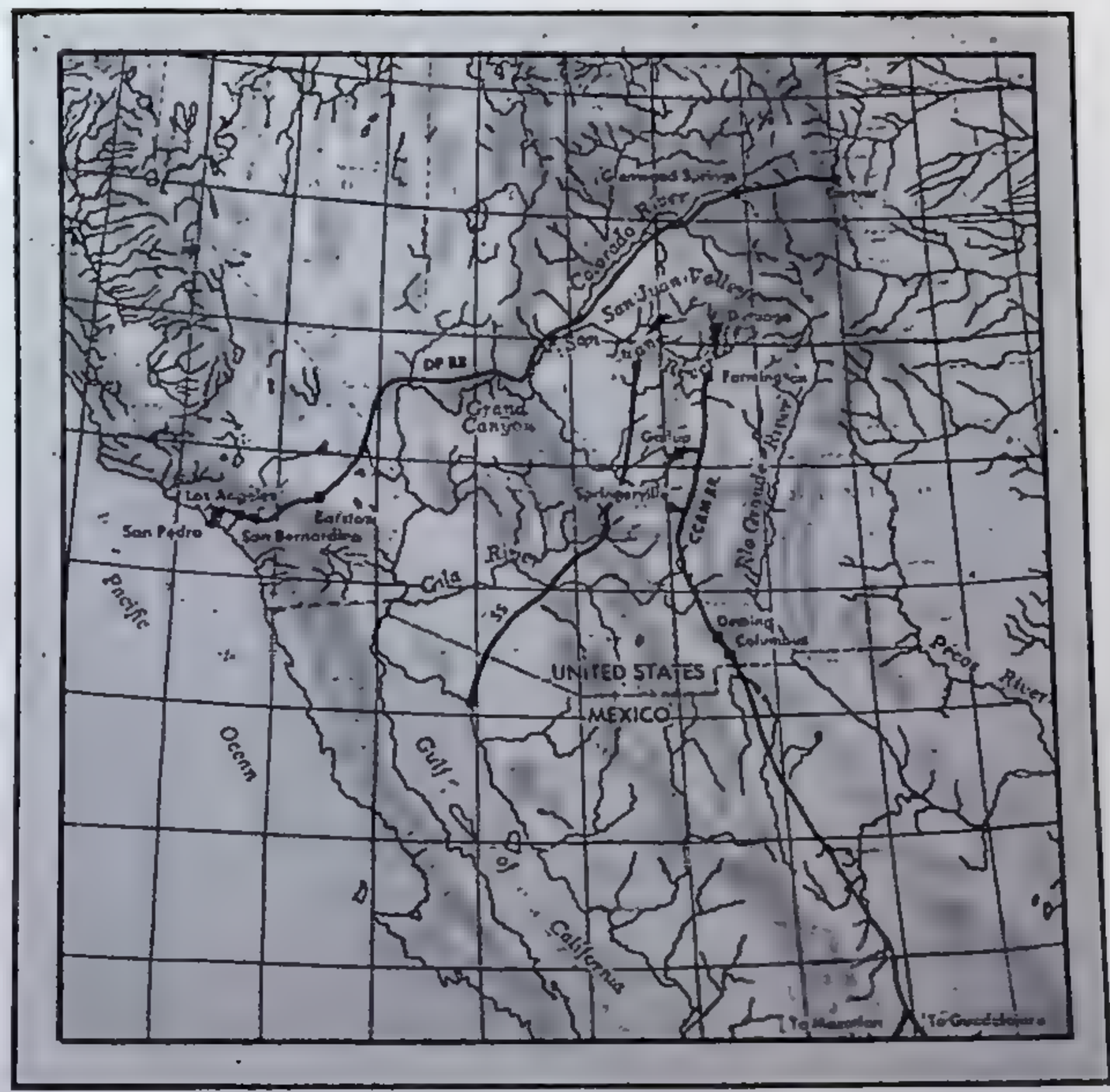
This company was incorporated back in 1905 under laws of New Mexico Territory, and its chief engineer made his report three years later. Fifteen years after that, in 1923, during which time the war had kicked prices sky-high, the company applied for permission to build, acknowledging most of its cost estimates were based on the old engineering report.

This railroad was to run up the Continental Divide from the Mexican border near Columbus, scene of Pancho Villa's raid, to Farmington via Deming, Tyrone and Hardcastle Gap, all in New Mexico. Branches would extend 25 miles to the Fort Bayard military reservation, 45 miles to Springerville, Ariz., and about 10 miles to Gallup. The line would cross the Southern Pacific at Columbus, the El Paso & Southwestern (now SP) at Deming, and the Santa Fe near Gallup. Total U. S. mileage would be about 550. This tail would wag the dog, 1200 miles of line in Mexico reaching south to Durango and these splitting wye-fashion, one line going to the port of Mazatlan and the other to Guadalajara, city of salubrious climate.

The company was undecided whether to use steam or electric power, and left this decision to the Commission. The applicant said the right of way would be donated. Cost of the U. S. portion would be near 12 m[illegible] dollars, to be raised by the sale of 20 n[illegible] dol-

lars worth of first-mortgage 5 per cent bonds. The report does not show what was to be done with the other eight million dollars. According to the company, the money was available, although its source was not revealed.

The railroad would rely for its traffic on farm produce, coal, and other minerals from the Farmington area, and on timber and livestock from its line and branches south of Gallup. Much of the coal would be handled into Mexico, which exportation would be balanced by lumber moving into the United States from Mexico. Gross revenue the first year was forecast at $6,600,000 (more than half the line's estimated cost) and $13,700,000 in the fifth year. There would be a million dollar surplus the first year, and in the fifth year, a three million surplus. But the Commission didn't agree.



In the first place, said the Commission, the line could not be built for the cost set by the applicant, and if the line were to be equipped for electric operation the cost would be much more. Steep grades in this rugged country would increase operating costs. The coal was of very low quality, whereas much better coal was available from the Raton field in northeastern New Mexico. Lack of water would prevent much increase in the livestock population. Because better timber was available nearer to markets, the timber along this line would be cut slowly. And only one-third of the route had actually been surveyed.

Very little information was available as to prospects for the line in Mexico, but it was known that two railroads already occupied more than half of the applicant's proposed route from Columbus to Durango.

Regarding the other end of the line, the Commission remarked that people of the San Juan Basin, near Farmington, had been making earnest efforts to get a railroad built south to a connection with the Santa Fe's main line. However, it doubted that such a carrier, if independently operated, could support itself.

The Commission concluded that the project as a whole had not been well studied, the engineering features were not sufficiently known, and the road would not have enough traffic to justify its construction in whole or in part. The application was denied.

Staley System of Electrified Railways

Decided December 5, 1923

Here was another example of Far West optimism, of a railroad to operate internationally in the United States and Mexico, and of a line to serve the San Juan River Valley in southwestern Colorado. This one was definitely to be operated by electricity. The application was submitted to the Commission November 27, 1923, after the CC&M submission, and was disposed of very quickly.

This line would extend 745 miles southwest from a point on the Colorado-Utah state line to the international boundary, and 66 miles beyond in Mexico to the Gulf of California, where the railroad's port facilities would transfer traffic into its own ten 10,000-ton ocean-going vessels for carriage to far-off destinations. Branches in the United States would bring total rail mileage to 1300.

(This sounds like the philosophy underlying construction of the Kansas City, Mexico & Orient, which on a great-circle basis was to divert 'round-the-world traffic to the Mexican port of Topolobampo and away from Los Angeles. The U. S. portion of the KCM&O is now the Wichita-Presidio line of the Santa Fe. See also the parenthesis in report on Denver Pacific.)

Total capital investment of the Staley system would come to 134 million dollars. As incorporation articles forbade issuance of bonds, the money was to come from sale of stock. The money was pledged, said the applicant, but in this instance, too, the source of the capital was kept secret.

The company would sell 51 million dollars worth of transportation the first year, and almost 70 per cent of that sum, 35 million dollars, would be net. In the fifth year, gross revenues would hit 103 million dollars with net revenue of 55 million dollars, or only 50 per cent of gross. This would be efficiency in reverse. The company had figured out a lot of things to save the Commission's time, even an operating ratio of 31.2 the first year and 28.9 the fifth year, due largely to a "favorable labor policy." But the Commission did its own figuring.

The Commission thought the estimates of revenue were excessive, and the estimates of operating expenses too low. "For example," noted the report, "the through rate on base bullion from Arizona to refineries near New York City is $14.50 per ton, but the applicant estimates earnings of $12.70 per ton for its haul of about 200 miles of this movement." And, "Notwithstanding the long and heavy grades, applicant estimates its operating expenses per ton-mile about 40 per cent of the Santa Fe's." Also, "It seems clear the applicant has over-estimated its traffic possibilities."

Again the Commission thought a line north of the Santa Fe main line might be useful for service to the San Juan Valley, "but the record does not satisfactorily establish that it could be operated independently at a profit. We conclude and find that the public convenience and necessity are not shown to require the construction of this line."

Denver Pacific Railroad Company

Decided November 28, 1933

This brakeman's railroad was to rewrite the geography books. Principal features of the application were its audacity, its light-hearted disregard of well-established geographical facts, and the insulting treatment given by railroad opponents.

Joining Denver, Colo., with San Pedro Harbor, Calif., this line was to be 800 miles long. It would go straight west across the Continental Divide and other rugged Colorado mountain ranges to Glenwood Springs. Then, turning southwest, it would parallel the vicious Colorado River, reputedly traversed by boat only once, to the Grand Canyon. It would go through or across the Canyon, on to Barstow, and then it would reach Los Angeles and San Pedro via San Bernardino. Electric power for its operation would come from Boulder Dam, at that time in process of construction.

(Back in 1904 the Grand Valley, Colorado River & South Pacific announced it would build a 1450-mile railroad from the head of the Colorado River to the Gulf of California via Grand Junction, Colo., Radium and Moab, Utah, and thence down the Colorado River. The Colorado River originates near the present site of Moffat Tunnel. At that time the Colorado Midland was operating into Grand Junction from the east. This company had been incorporated under Arizona laws, capital 50 million dollars.)

Cost of the Denver Pacific would be $98,500,000, to be financed by 75 million dollars in stock and the balance in bonds. The company would handle 41 million tons of freight the first year, taking in 179 million dollars. The fifth year's revenue would be 300 million dollars, with net revenue of 50 million dollars, or half the total construction cost. Distance from coast to coast would be shortened by no less than 500 miles, and at least 20 hours of time would be saved on every haul. The shortest combination of existing lines, D&RGW to Provo, thence Union Pacific, exceeded 1300 miles in length.

Principal sponsor of the Denver Pacific was a retired railroad trainman who did not even show up at the Commission hearing. His only witness was a surveyor and mining engineer who had been tentatively retained, without remuneration, for some six months. He acknowledged the line had been "surveyed" only by

Optional routes

TRAINS each month prints a brief listing and survey of available routes between larger cities.

Detroit and Dayton - Cincinnati:

New York Central—Day train and night train each way; through coaches and sleepers, but no local Dayton cars. Time, about seven hours.

Baltimore & Ohio—Overnight trains each way, daily afternoon train south, noon train north; also weekday morning locals as far as Toledo. Night trains have local cars for both Cincinnati and Dayton. Coaches. Time about same as NYC.

Wabash-Pennsylvania—Overnight sleeper, Cincinnati only (not Dayton), on approximately competitive schedule. Via Fort Wayne.

airplane, that physical barriers absolutely prohibited the construction, and that airline distance between Denver and San Pedro was more than 800 miles. Yet here he was, urging the Commission to permit construction. Talk about galloping off in all directions at once!

Intervenors in opposition were the Union Pacific, Southern Pacific, Santa Fe and D&RGW, the latter at that time completing its Dotsero Cutoff. Representatives of these railroads, by their actions, reflected the regard held by the public at large for this application. They appeared at the hearing but offered no evidence.

In squelching the Denver Pacific, the Commission retained its dignity, using the words, "We are of the view that the applicant's contentions are without merit." The entire report occupied less than two small pages of type.

Wouldn't it be nice if:

. . . American railroads would institute a system of low "wholesale" fares for families and groups traveling together, as is done in various European countries? It seems to me that would enable them to meet with better success the competition of the private automobile. One person can travel by train, even the most expensive trains, cheaper than he can drive his own car, but if he has a family of five or six and wants to take them all with him, the advantage is all with the automobile. The last time I went abroad with my family, it cost me more to go from California to New York than from New York to Paris, in spite of the fact that the latter included all our meals and the former included none. And in Switzerland we bought scrip tickets good for two weeks without any mileage limit. We could have spent all our waking hours traveling on the Swiss railroads during that time and it would not have cost us an extra cent.

Clifford H. Bissell.

Contributions to this department should be addressed to "Wouldn't It Be Nice If" Editor, Trains, Milwaukee 3, Wis.

Roy Greene Proposed Construction

Decided September 24, 1938

This, the Commission's last significant denial of permission to build a railroad, is presented out of chronological order to save the most horrible example for the last. But in some ways, no attempt could be more presumptuous than this one.

Remember the old South Penn Railroad? This company acquired and partially improved a right of way for most of the distance between Pittsburgh and Harrisburg, all in Pennsylvania. Sometimes called the West Penn, it was Vanderbilt's big gun in his New York Central fight with the Pennsylvania Railroad in the late 1880's. As its retaliation, the Pennsy backed the West Shore road along the Hudson River to Albany and thence west to Buffalo. Many of the South Penn tunnels were bored, vegetation removed and fills made; but before the line was completed the parties called off their fight. The Pennsylvania agreed to stay out of NYC territory; NYC took over the West Shore and abandoned the South Penn project. The tunnels and fills went back to grass, weeds and trees. About 1905 a B&O subsidiary took title to the property, no doubt to keep others out. (George Gould's entrance into Pittsburgh occurred in August, 1904. From the west, he used W&LE and his newly constructed Wabash-Pittsburgh Terminal Railroad. At that time, who knew his venture would bankrupt all his railroads?)

Roy Greene, an individual, applied more than 30 years later for a certificate authorizing him to build and operate a double-track railroad 203 miles long from Pittsburgh to Harrisburg, using this old South Penn right of way and tunnels. This *could* have been almost as much of a real trunk line as Loree's New York, Pittsburgh & Chicago Railroad, or maybe even better. In theory, it could. It would have provided a bridge between the P&LE and P&WV (successor to Gould's Wabash-Pittsburgh Terminal) at Pittsburgh, and the Reading at Harrisburg, making a new through route between east and west in a region characterized by railroad men as "heavy-traffic" territory. Its line would be 40 miles shorter than Pennsy's existing main line, its grades not so steep. But the cards were stacked against Roy Greene. He had no money, no railroad experience, no assurance of traffic—in fact, Roy Greene had nothing but nerve. And he was too late, by more than a year, to get title to the property. Note now the timing.

The Pennsylvania legislature, on May 21, 1937, had created the Turnpike Commission for the purpose of constructing, operating and maintaining a toll highway between Pittsburgh and Harrisburg, using this old route east of Irwin, very near Pittsburgh. It was not until a year later—June 2, 1938—that Roy Greene filed his application. By the time the Commission uttered, in September, 1938, Pennsylvania's Department of Highways had spent some $400,000 in preliminary work on what is now the superhighway.

But even had Roy Greene acted earlier, he would likely have lost. He showed himself to

be an independent consulting electrical engineer, then employed by W. P. A.; said he had no funds; acknowledged he hadn't surveyed the route and hadn't even seen it except at a few points on its 80 miles west of the Allegheny Mountains. He was going to use, he said, records of the old surveys made many years before.

The construction would cost 30 million dollars, to be loaned by R. F. C. or other federal agency. Having put up all the money, the federal government would control the railroad and operate it in the interests of the country as a whole. Roy Greene himself was to be hired in an advisory capacity on a fee basis during construction and as technical advisor in operation on a royalty based on gross income. Nice work for Roy Greene, if he could get it.

Nice work for the people of Pennsylvania, if Roy Greene were correct. For he said the railroad would "develop a vast wilderness, as yet undeveloped because principal railroads and highways had failed to provide adequate transportation." Half the traffic would be diverted from existing railroads but the other half would be created by the development magic. Also, he would demonstrate the inherent advantages of the electric drive on railroad power units and thereby prepare the way for ultimate electrification of American railroads. Within five years the property would be handling 3600 passengers and 400 cars of freight, and taking in up to $120,000 a day.

The Commission remarked that Roy Greene was his only witness, had made no study of construction and operating costs, hadn't established means of entrance into his terminal cities, hadn't shown he could get his right of way or money to improve it, nor traffic to support his railroad. These prerequisites, said the Commission, "were ignored or considered by the applicant to be a mere detail which could be worked out later. . . . The applicant failed to show the territory was deprived of adequate transportation or that there was any public need for the line proposed. It follows that the application must be denied."

St. Louis-Kansas City Short Line Railroad

Decided December 9, 1935

Turn now to central Missouri, where a revolutionary lone-wolf railroad was to show up all others as outmoded in original conception, operation, and financing. This proposal will long remain a classic; its record consists of the application, petitions, and briefs filed by the parties, reports and orders of the Commission, 701 pages of testimony, 56 exhibits filed at the hearing, and 51 pages of oral argument.

The Short Line men would run their own railroad according to their own brilliant ideas, and not like stick-in-the-mud old-timers, who were hidebound by tradition or something. Their double-track line, connecting St. Louis and Kansas City via Columbia, would be 40 miles shorter than the shortest existing line. There would be no farm or highway grade crossings; these would be eliminated by expenditure of $1,600,000. Steam power would be used for the freight trains, and through freights would be moved over the line in about seven hours. The Short Line didn't clutter up its application with any indicated allowance for car rentals because it wasn't going to interchange equipment with other railroads. Most of its freight would consist of coal mined along the line.

An improved type of oil-electric engine, capable of cruising at 100 miles per hour, would pull 10 passenger trains each way daily at an over-all average of 80 miles per hour, shortening the trip to about four hours. This service would be supplemented by local passenger trains. Each train would consist of power car with smoker, express and mail compartments, followed by one or two trailers. There would be no Pullman service.

All this may sound like a dispatcher's nightmare, but the bankers came in for their education, too. All the 35 million dollars of construction cost would be borrowed from R. F. C. Immediately the road was completed, annual operating revenues would begin coming in at the rate of 13 million dollars, about 10 million being freight revenue. With operating ratio of 64.5, this would provide net income, after payment of all charges, of around two million dollars a year. Unfortunately, the Commission didn't fall in with the general spirit of things.

The Commission noted that the four direct and three indirect lines of railroad already operating between St. Louis and Kansas City provided 12 passenger schedules a day. An improved highway paralleled the proposed line, carrying 11 daily bus schedules and nobody knew how many trucks; barges chugged up and down the adjacent Missouri River, which had been improved at government expense; R. F. C. had already loaned millions to the existing railroads, some of which were bankrupt. The record did

not show that the applicant had been assured of any of the traffic anticipated. Operating ratio of the other railroads had averaged 76.8 for the preceding four years.

Opposition witnesses testified that service such as that proposed by the Short Line would require at least a four-track railroad; that interchange of equipment is essential for successful railroad operation; that people living in the college town of Columbia, 11 miles from the coal mines, preferred Illinois fuel, low-grade as it was, because the Missouri coal clinkered so badly.

"Taken as a whole," said the Commission, "the applicant's estimates of traffic and revenue appear to be excessive and over-optimistic, and are not reasonably supported by facts of record. It is clear that the territory is reasonably well served by existing railroads and other means of transportation, and that the lines serving the territory have had heavy losses in recent years, have ample capacity to handle an increase in business, and could ill afford to lose the traffic which would be diverted by the proposed operation. The record fails to show there is substantial need of another railroad in the territory and it has not been shown that the applicant has any funds available for construction of the line.

"We find that the present and future public convenience and necessity are not shown to require the construction by the St. Louis-Kansas City Short Line Railroad Company of a line of railroad described in the application. An order of denial will be entered."

And there you have, in one report, a comprehensive illustration of the working of Convenience and Necessity. Too much transportation was available already and nobody needed the Short Line; no industry, no territory, would benefit; the company did not propose to risk its own money; many of the existing carriers were in bankruptcy and would suffer more if the line were built. And if all that weren't enough, the plans were just not workable. Mark it down in your book that you can't run a railroad without interchanging cars. Only the promoters could have profited from the Short Line's construction.

This was, to use a fancy term, a prime example of arrogance and pure nonsense. Convenience and Necessity stopped it. Score one for the Interstate Commerce Act and its administrator, the Interstate Commerce Commission.

So You Know Your Railroads?

This little test will tell the tale. Perfect score is 100; Excellent, 85; Very Good, 75; Fair, 50. Below that, you'd better spend more time reading Trains

BY ROY G. CLARK

1. What is the longest sleeping-car run on any one U. S. A. railroad? Pretty easy, so good for only ---------- 5 *points.*

2. Can you name a railroad that operates in both the states of Louisiana and South Dakota? You've got to know your branch lines to get this one, so we'll allow ---------- 10 *points.*

3. What is the longest trip, in one direction, that you can make on one railroad on the North American continent? That "continent" tips you off, so only ---------- 5 *points.*

4. The B&O and the Pennsylvania have a virtual monopoly on the Chicago - Baltimore passenger business, but quite a few years back another big eastern system made a serious bid for the business by a combination route. Even if you don't remember it, you probably can guess it, so just ---------- 10 *points.*

5. Now, name a railroad that operates in both the states of Indiana and Washington. Yeah, another one. Well, anyway, just name the line and take ---------- 10 *points.*

6. A 350-mile line in western Canada has no physical rail connection with any other line, but it operates sleeping-car trains. This one's good for ---------- 15 *points.*

7. This city is served by the passenger trains of the Burlington, C&NW, Great Northern, Illinois Central and Milwaukee Road. Name the city for ---------- 10 *points.*

8. Name two routes by which you could travel from the Atlantic to the Pacific coasts, using only two railroads on each route. Just a breather for ---------- 5 *points.*

9. Identify these two sets of cities: (*a*) the first two are 85 miles apart and are served by many fast trains on two steam roads and one electric line; (*b*) the second two are 40 miles apart and two railroads give them fast and frequent service. One road used to advertise "A Train Every Hour on the Hour." Shucks! So easy we can allow only ---------- 5 *points.*

10. And here's the pay-off question: Name two sleeper runs, each under 750 miles, that are operated over four or more roads. Credit yourself with 10 points for each route correctly answered, and for the two, take ---------- 25 *points.*

Answers on page 44.

New Haven Power

Complete photographic review of this road's 731 locomotives

All photos courtesy New Haven Railroad.

10* EP-1 These original (Nos. 01-041) passenger locomotives were built in 1906-08 for the electrification. Wheel arrangement 1-B — B-1, four motors, no driving gears, AC-DC. Total weight 220,000 pounds. Maximum tractive effort 19,600 pounds.

* First number indicates the number of locomotives in each class and is not part of the class number.

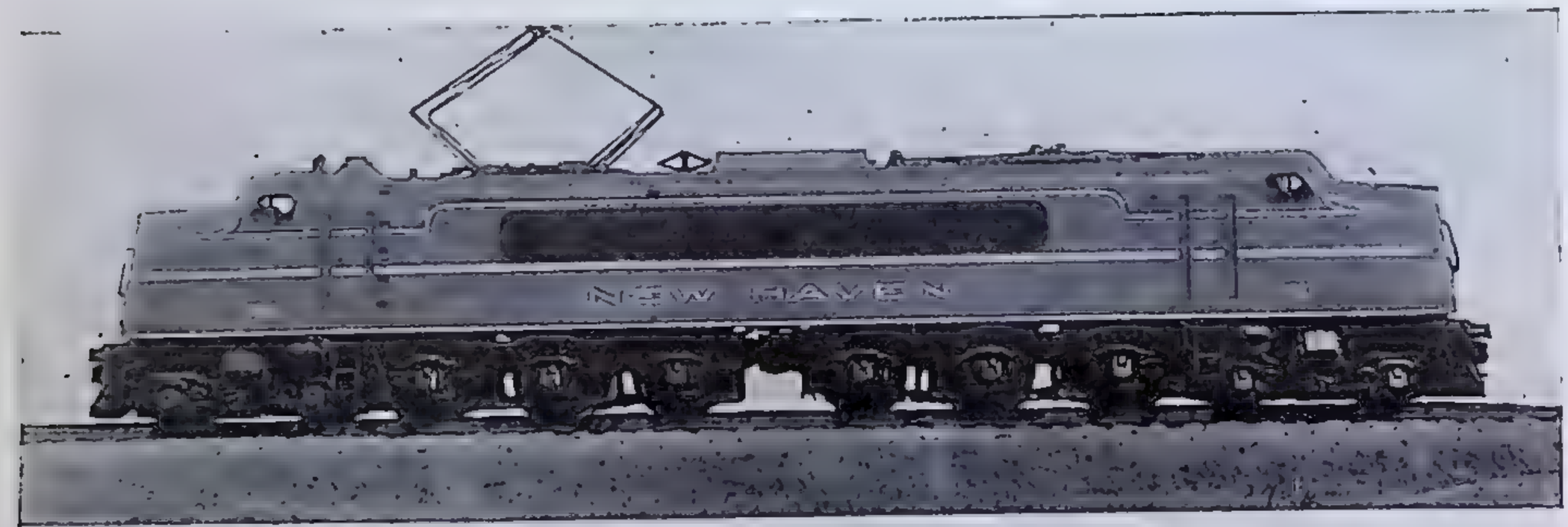
24 EY New Haven has 24 of these electric switching locomotives, Nos. 0200-0223, built in 1911-27. Wheel arrangement B + B, four motors, A. C. only. Total weight 158,000-211,500 pounds. Maximum tractive effort 42,000 pounds.

37 EF-1 These electric freight locomotives, Nos. 073-0111, were built in 1912-13. Wheel arrangement 1-B + B-1, eight motors, A. C. only. Total weight 232,000 pounds. Maximum tractive effort 50,000 pounds.

27 EP-2 These electric passenger locomotives, Nos. 0300-0326, were built 1919-28. Wheel arrangement 1-C-1 + 1-C-1, 12 motors, A. C.-D. C. Total weight 350,000-358,000 pounds. Maximum tractive effort 47,500 pounds.

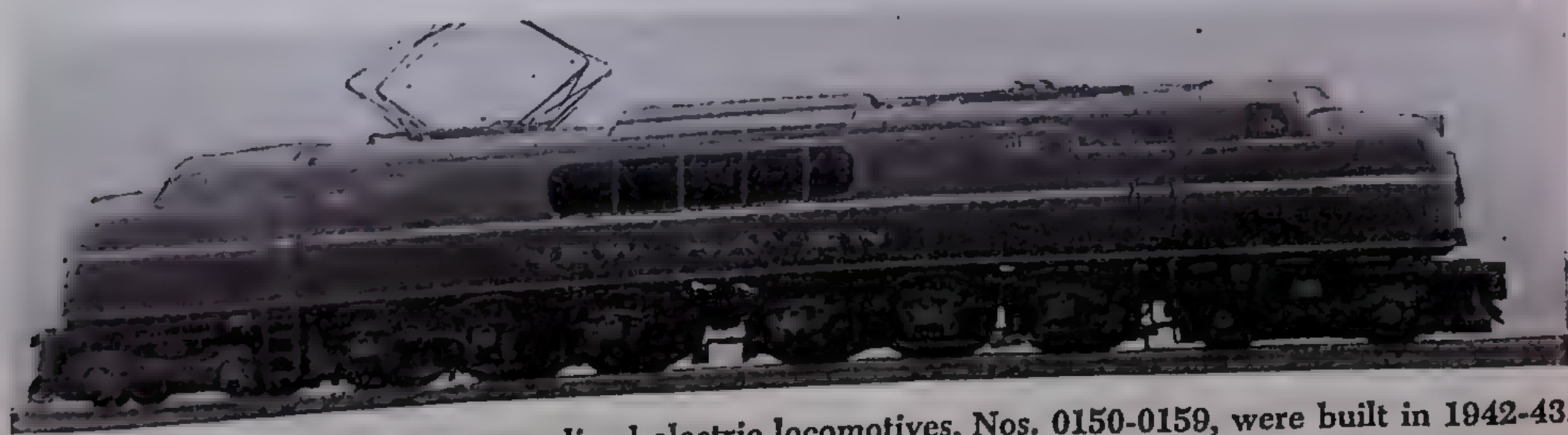
199 Multiple-unit coaches are the backbone of New Haven's New York commuter traffic. Traction motors distributed throughout the train give plenty of rail adhesion, with consequent quick acceleration.

10 EP-3 Heavy electric passenger locomotives, Nos. 0351-0360, built 1931. Wheel arrangement 2-C + C-2, 12 motors, A. C.-D. C. Total weight 403,000 pounds. Maximum tractive effort 68,500 pounds.



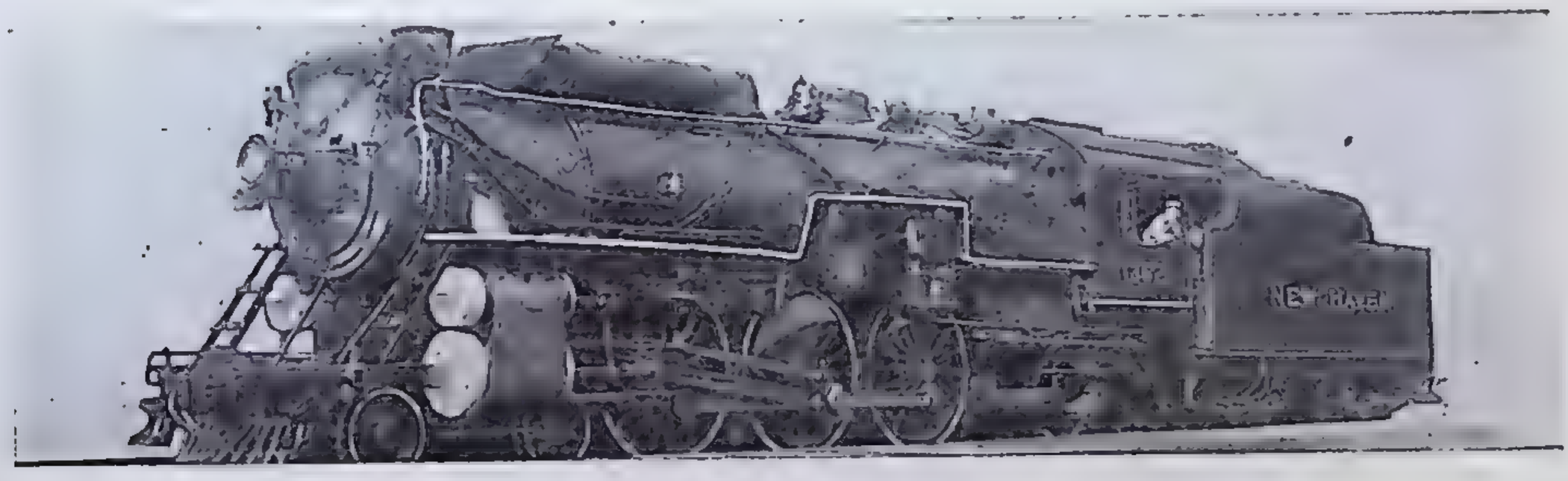
6 EP-4 The first streamlined electric passenger locomotives, Nos. 0361-66, were built in 1938. Wheel arrangement 2-C + C-2, 12 motors, A. C.-D. C. Total weight 432,000 pounds. Maximum tractive effort 68,500 pounds.

5 EF-2 These five EF-2 freight locomotives are similar to EF-1's, but total weight is 282,000 pounds and they have motor-generator set, with D. C. traction motors.



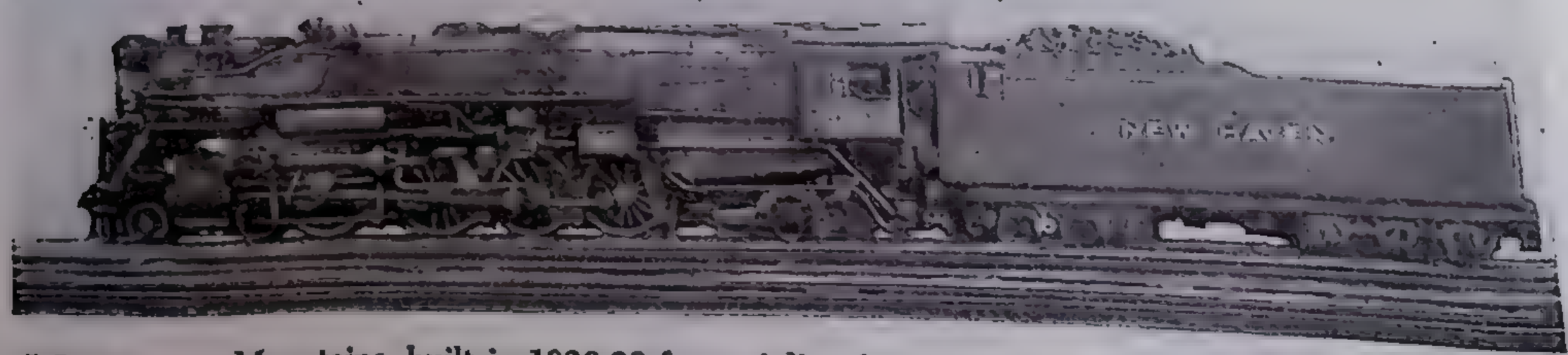
10 EF-3 These 10 EF-3 streamlined electric locomotives, Nos. 0150-0159, were built in 1942-43. Wheel arrangement 2-C + C-2, 12 motors, A. C. only. Total weight 492,000 pounds. Maximum tractive effort 90,000 pounds.

10 I-5 Hudsons, built in 1937, are the blue-ribbon steam locomotives for mainline passenger service; used for 12- to 17-car trains. Nos. 1400-1409, 80″ drivers, 44,000 pounds tractive effort.

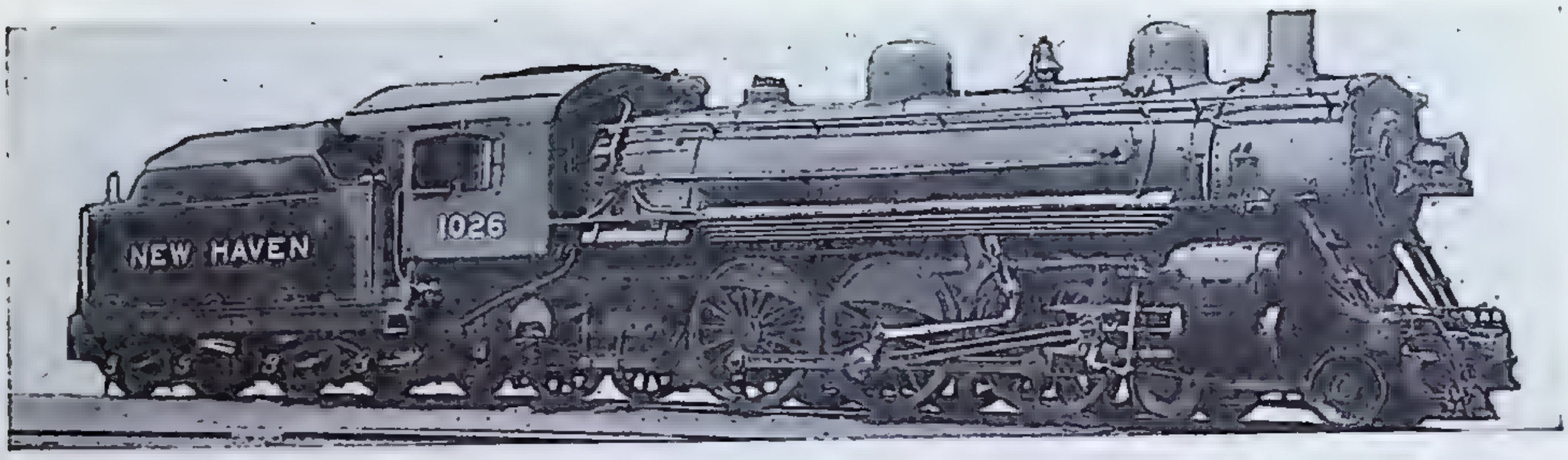


47 I-4 Pacifics, built in 1916 for mainline passenger service. Now used for 8- to 12-car trains. Nos. 1350-1399, 79″ drivers, 37,650 pounds tractive effort.

25 J-1 Mikados, built in 1916 for mainline freight service; now used for smaller symbol freights. Nos. 3000-24, 63″ drivers, 50,600 pounds tractive effort.

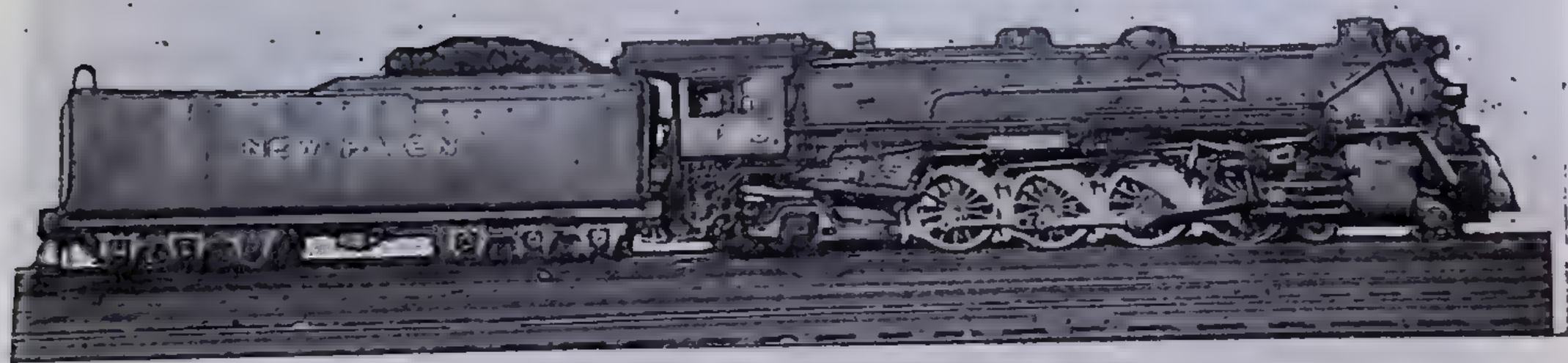


13 R-3 Mountains, built in 1926-28 for mainline freight service, still so used. Nos. 3550-3562; 69″ drivers, 71,000 pounds tractive effort, 265 pounds boiler pressure, three cylinders.

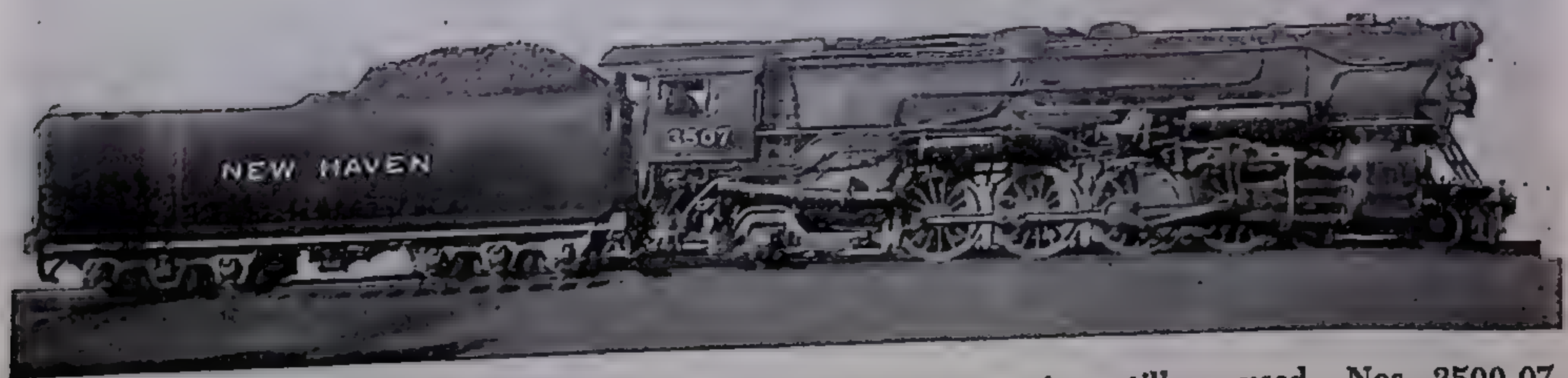


32 I-1 Pacifics, built 1907-10 for heavy mainline passenger service; now used mostly on Boston locals. Nos. 1000-31, 73″ drivers, 34,493 pounds tractive effort.

49 I-2 Pacifics, built 1913; first built for mainline passenger trains with steel cars; now in Boston - New Bedford, Hartford - Waterbury, etc., service. Nos. 1300-1349, 73″ drivers, 37,558 pounds tractive effort.

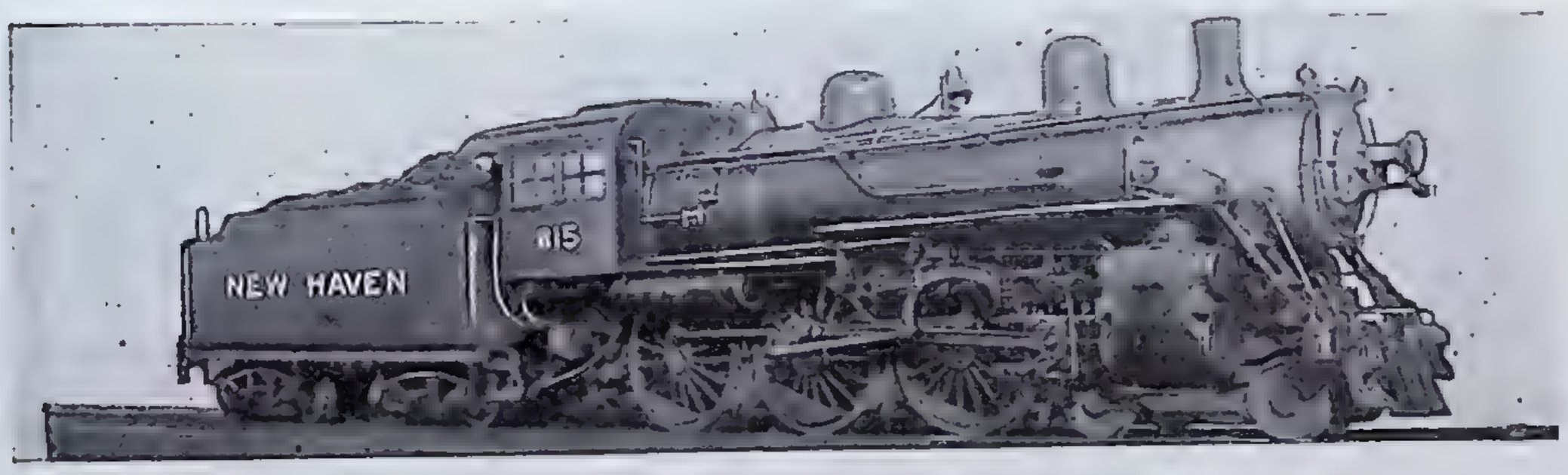


49 R-1 Mountains, built 1919-24 for mainline freight service; still so used. Nos. 3300-3348, 69″ drivers, 53,900 pounds tractive effort.



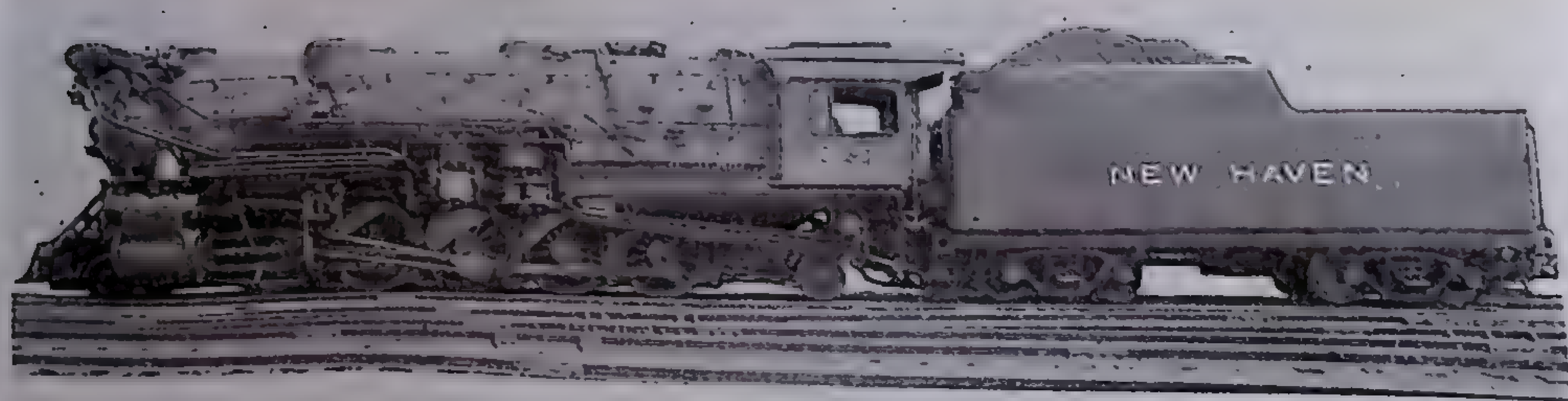
8 R-2 Mountains, built 1924-26, for mainline freight service; still so used. Nos. 3500-07, 69″ drivers, 68,000 pounds tractive effort, 265 pounds boiler pressure. No. 3500 is exception with 63,400 pounds tractive effort, 250 pounds pressure.

15 F-5 Consolidations, built 1912 for Maybrook - New Haven freight service; now in local service. Nos. 150-164, 63″ drivers, 44,800 pounds tractive effort.



17 G-4 Ten-Wheelers, built 1904-07 for high-speed passenger service; now in work-train service. Nos. 804-847, 73″ drivers, 27,840 pounds tractive effort.

7 H-1 Atlantics, built 1907 for high-speed limiteds; now mainly Boston - Providence service. Nos. 1100-1111, 79″ drivers, 25,725 pounds tractive effort.



50 L-1 Santa Fe's, built 1918 for Cedar Hill - Maybrook freight service; still so used. Nos. 3200-3249, 63″ drivers, 77,800 pounds tractive effort.

New Haven's Diesels

10 0600

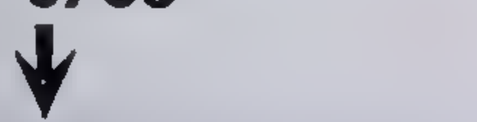
Star performers on the New Haven's war front are its 88 Diesel-electric switchers, many of which work 24 hours a day. Latest of these are 10 1000-horsepower locomotives built in 1944. When all present orders are filled, the New Haven will have 110 Diesel switchers.

The first dual-purpose Diesel locomotives in the country are the New Haven's 30 0700 series, Nos. 0700-0729, used interchangeably in road freight and passenger service. Many of these make four trips a day between New Haven and Boston, their ability to take any type of train vastly improving the monthly mileage to which they can be assigned. Of 2000-horsepower each, they are normally used in pairs, coupled back to back, to make 4000-horsepower locomotives. Thirty more are on order.

1 0900 Built in 1931, this experimental 600-horsepower Alco Diesel switcher was forerunner of hundreds of its type now in country-wide operation.

30 0901 Built in 1936-37, of 600-660-horsepower, Nos. 0901-0910 have interchangeable engines, even though five are powered by Cooper-Bessemer Diesels and five by Ingersoll-Rand. They were followed in 1938-39-40 by Nos. 0911-0930, also 600-660-horsepower.

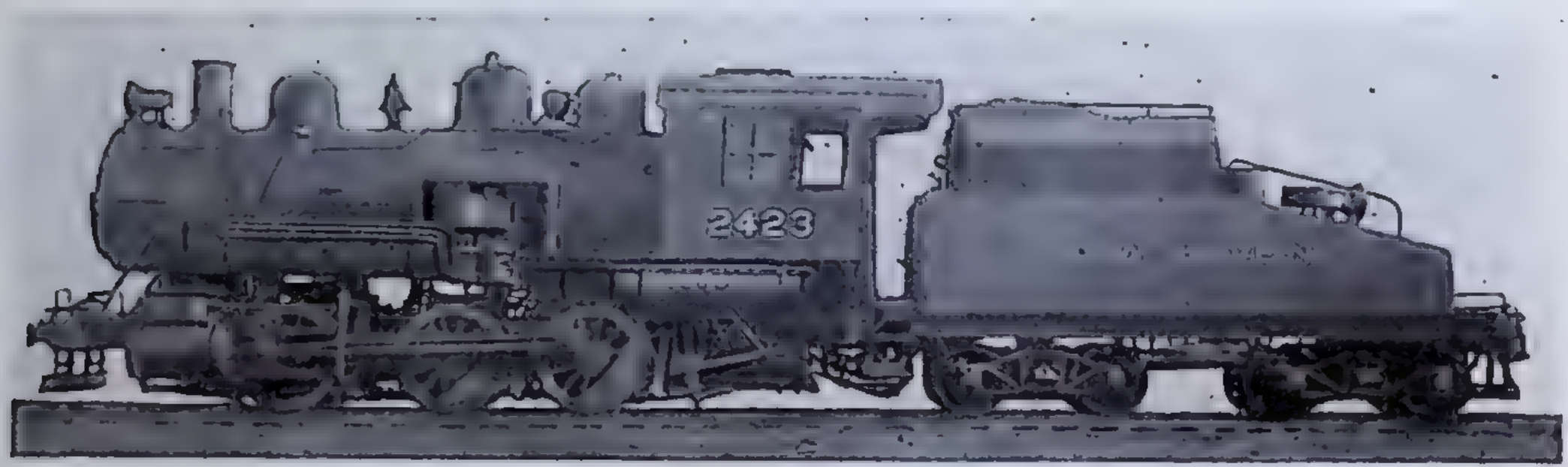
30 0700



40 0931 With lowered hood for increased visibility, Nos. 0931-0970, built in 1941-42-43-44, have mechanically-driven instead of electric-motor-driven auxiliaries. They are of 600-660-horsepower.

7 0800 Seven of these 380-horsepower small heavy-duty switchers, built in 1941, were designed for outlying or smaller locations; have automotive-type Diesel engine generator sets. Nos. 0800-0806.

73 K-1 Moguls, built 1900-07, for mainline freight service; now in light local service. Nos. 260-479, 63″ drivers, 30,223-34,700 pounds tractive effort.



38 T-2 Six-wheel switchers, built 1900-13 for flat yard switching; still so used. Nos. 2300-2466, 51″ drivers, 31,286 pounds tractive effort.

35 Y-3 Eight-wheel switchers, built 1920-23, for classification-yard, transfer, and hump-yard switching; still so used. Nos. 3400-3434, 51″ drivers, 55,360 pounds tractive effort.

16 Y-4 Eight-wheel switchers, built 1924-27 for classification-yard, transfer, and hump-yard switching; still so used. Nos. 3600-3615, 57″ drivers, 60,600 pounds tractive effort, three cylinders.

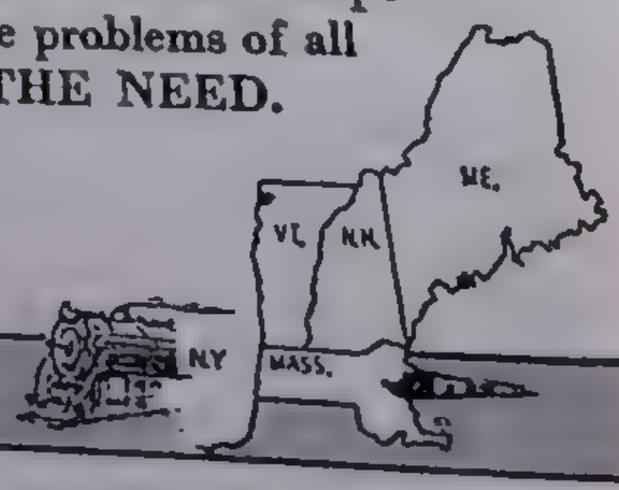
"First things first..."

This boy is doing "first things first." To him the first thing to do when he came home from Tarawa, Guam, Saipan was to give his blood to the local Blood Donor Center.

For the Boston and Maine Railroad, "first things first" means handling in 1945 an immense volume of war freight (1944 was one of the largest volume years in the history of this railroad). We have—and will—move everything we are asked to, with speed and dispatch. It means buckling down—pitching in—determined to help and to help *fast*. Shortages of ammunition, planes, tanks, food, clothing must never overtake brave men. That's our common job—and that's the job of every industry, of every transportation company, of every individual today.

To be a part of this job—to help industry get its products away from freight houses and loading platforms quickly and efficiently—to speed them on their way to the front is our immediate concern. Of course, some of us are working on post war plans, but "first things first" *for us* means speeding war material from all sections of the country to embarkation points without interruption.

We have done and are doing this and can continue to do so with ever-increasing efficiency because we know Northern New England—know the tempo of its workmen, know the problems of all shippers—and KNOW THE NEED.



BOSTON *and* **MAINE**

ONE OF AMERICA'S RAILROADS - ALL UNITED FOR VICTORY

Trains - Month 1945

How Sharp Is Sharp?

Railroad curves are measured not by their radius but by degree of curvature, a method which ties in more closely with the surveying methods actually used in laying out the curves. The curvature of a railroad curve is the number of degrees of central angle subtended by a chord of 100 feet along the curve. It sounds sort of mysterious, but all you need to determine the degree of a railroad curve is a cord exactly 62 feet long with a knot in the middle, a ruler graduated in inches, and a couple of pieces of chewing gum. Stretch the 62-foot cord between two points on the gauge line of the outer rail. With the rule, measure the distance from the gauge line of the rail to the knot in the center of the cord. This distance in inches equals the curvature of the track in degrees.

Strange Motive Power

In the early stages of their development, both the Baltimore & Ohio and the South Carolina railroads tried cars with treadmills driven by horses, according to the Association of American Railroads. It is reported that the strange contrivance tried out by the B&O was condemned after it had been derailed by a tresspassing cow. Other experimental power tried by the B&O and the South Carolina included cars equipped with sails.

Passenger Revenues

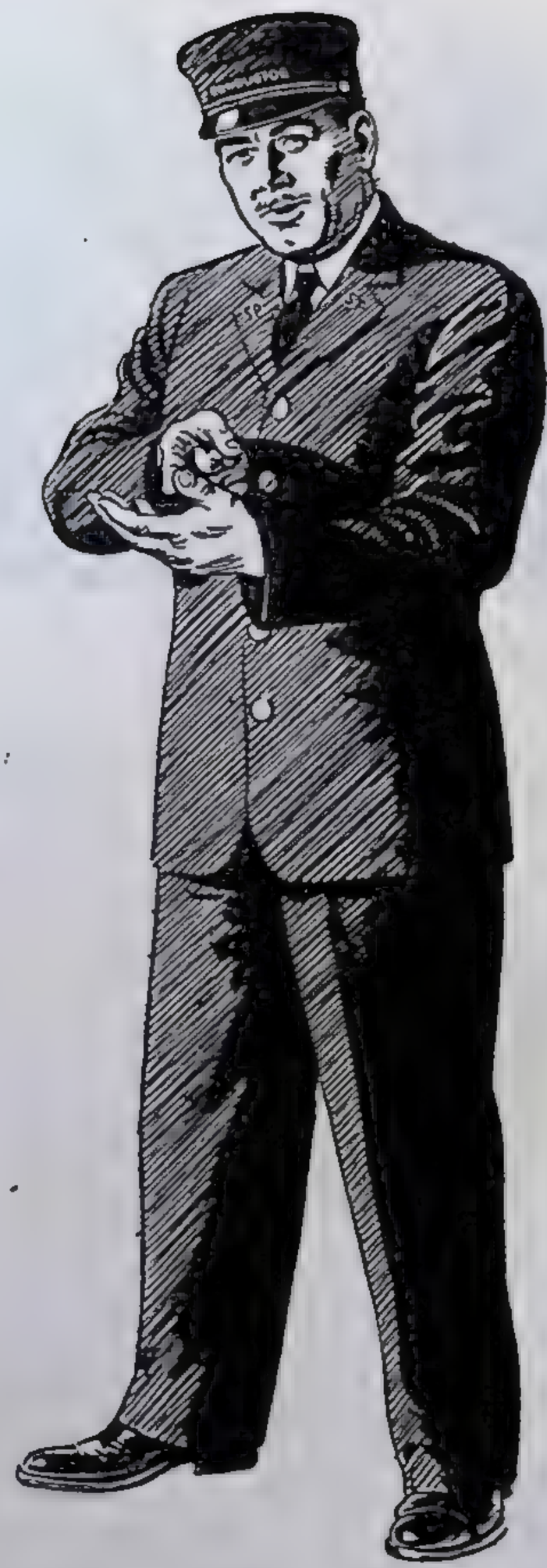
It was news last year that the American railroads as a whole made a profit on their passenger business for the first time in years, but it isn't news that some trains and some railroads come out better on passenger operation than others. The average passenger train, including commutation runs, carries some 125 passengers, but there is quite a difference between a local with 10 or 12 passengers and a revenue of 50 or 60 cents a mile including express and mail, and a streamliner with 700 passengers and a revenue of $10 a mile. Yet many of the basic costs remain the same for each. In normal times the only railroads showing a profit with passenger revenues less than the passenger operating costs were the Long Island, the New York Central, the New Haven, the New York, Ontario & Western, and the Richmond, Fredericksburg & Potomac. Some large systems, such as the Pennsylvania, hovered in the neighborhood of 100 per cent passenger operating ratio, but the majority were up around 125 per cent or more. Small roads with little passenger service make the worst showings, some spending as much as $5 on passenger operation for every dollar taken in!

Both photos courtesy Reading Company.

Before and after pictures of the same station on the Reading at South Bethlehem, Pa., taken many years apart. In both photos, the curve to the right is on approximately the same alignment. A new bridge across the Lehigh River was built in the last few years and its approach ramp was wrapped around the curve of the railroad tracks. The new station platforms were also built here. In the lower picture, a train bound for Buffalo is on the tracks to the left which are used by the Lehigh Valley.

Yes, we know there's a war going on!

—but here's how we're trying to overcome the difficulties of wartime travel



Our trains are longer and schedules are slower now. Space is hard to get. People frequently have to stand in line to buy tickets or to get into the dining car. In short, our service isn't what it was before the war.

The main reason is that our volume of passenger traffic is *five times* that of 1940, with just about the same number of cars we had then. And, like everybody else, we are short of help.

Wherever possible we have taken aggressive steps to lessen the difficulties of wartime travel. For example:

1 Our "train assignment plan" for coach passengers has to a large extent eliminated overcrowding and standing on our long-distance trains. We endeavor to sell only as many seats as are on the train, and each passenger gets a reservation slip.

2 "Passenger aides," have been stationed on long-distance S.P. coach trains. They assist women traveling with children, aid the aged and infirm, and perform other services to make the journey as comfortable as possible.

3 We have greatly expanded telephone reservation bureaus, increased our forces handling reservations, and devised new reservation systems. The situation is not perfect, but it is much better than it was.

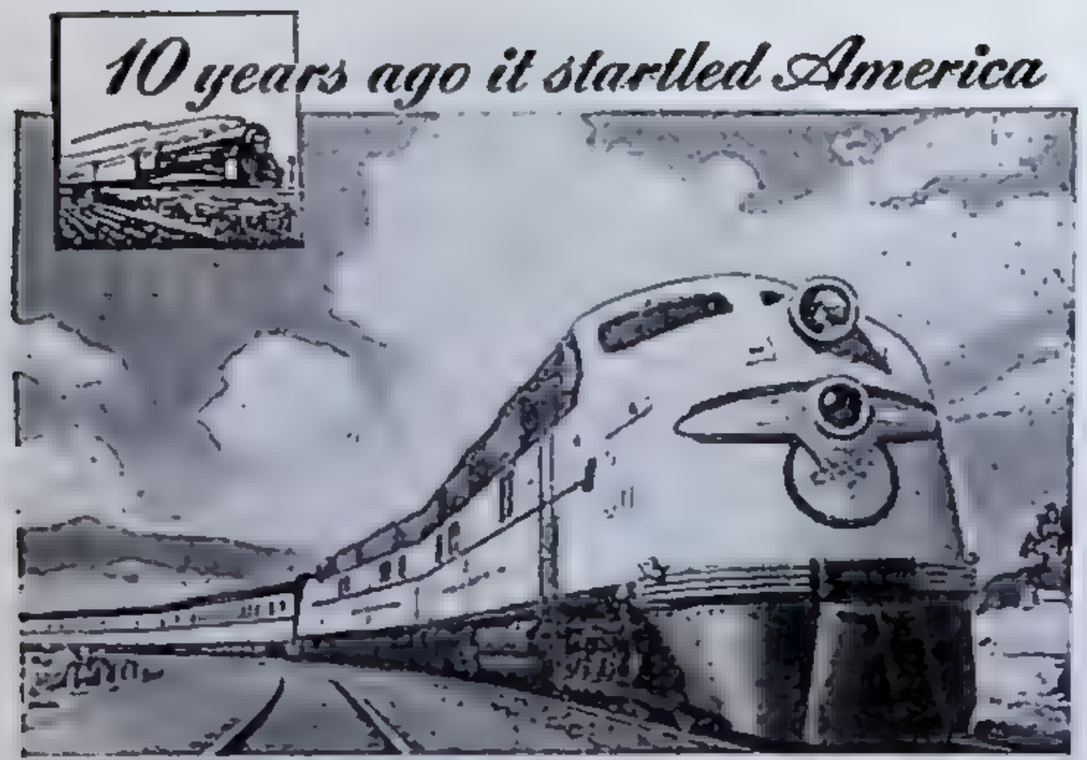
4 We have increased the number of chair car porters, so that cars are now generally kept quite clean, a difficult problem because of the litter from box lunches, etc.

5 "Train service agents" have been added to the staffs of long-distance coach trains. These men supervise the chair car porters, see to it that the trains are kept tidy, try to overcome difficulties and meet emergencies.

We don't claim that all our people are perfect. They're human beings, and are under the strain of crowded war conditions. By and large we think they're doing a swell job and we're proud of them.

S·P

The friendly Southern Pacific



The Famous "400"

—the train that *set the pace* for the world

We are celebrating the tenth anniversary of the famous "400" here at "North Western." On January 2nd, a decade ago, the train that "set the pace for the world" made its initial run between Chicago and St. Paul-Minneapolis, via Milwaukee.

Thousands thronged the right-of-way as the "400" sped past on its maiden trip—and traveling America soon took this flashing train to its heart. It embodied the triple features of *speed, comfort* and *beauty* as never before.

Today the "400" is known throughout the length and breadth of the land. No longer is it one train but a *fleet* of trains—and daily these gleaming green-and-yellow streamliners glide gracefully from Chicago to serve the transportation needs of Wisconsin, Upper Michigan and Minnesota.

The additional "400" Streamliners that make up the famous Fleet were introduced in January, 1942, soon after Pearl Harbor. They have played a vital part in transporting our armed forces and those engaged in war work—and will continue to do all they can to help speed the day of victory.

★ ★ ★

The second decade of "400" service has now begun. Wartime travel is heavy and there are times when trains are over-crowded. We thank you for your patience and understanding. Our desire now, as always, is to serve our patrons to the best of our ability.

Condensed Schedule of the Twin Cities "400"

Northbound		Southbound
2:45 pm Lv.	Chicago	Ar. 9:15 pm
4:00 pm Lv.	Milwaukee	Lv. 8:00 pm
9:15 pm Ar.	St. Paul	Lv. 2:45 pm
9:45 pm Ar.	Minneapolis	Lv. 2:15 pm

CHICAGO and NORTH WESTERN SYSTEM

SERVING AMERICA IN WAR AND PEACE FOR ALMOST A CENTURY

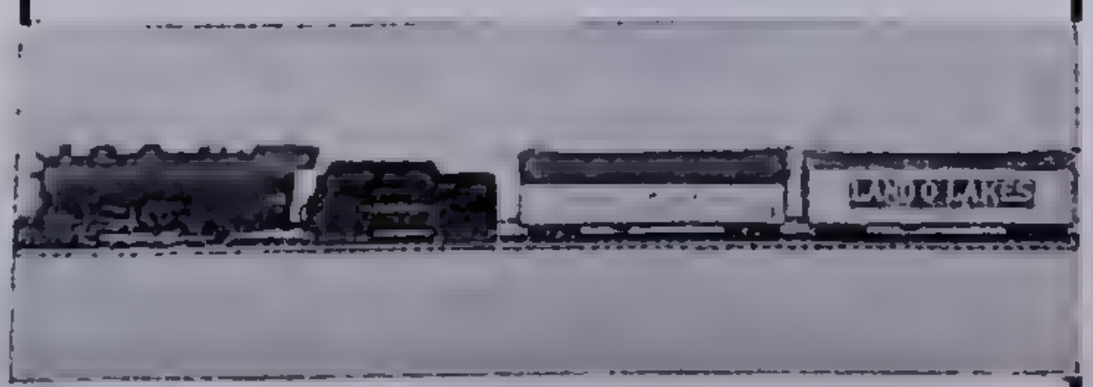
This reservation shortage

The shortage of hotel rooms is if anything worse than the shortage of Pullman space. Witness the case of a friend of ours who couldn't get a hotel room in New York City. He had to be in Philadelphia the next morning, so he canvassed the railroad ticket offices and finally located a lower berth in the Baltimore & Ohio St. Louis car, arriving in Washington early the next morning. He got up in Washington and grabbed the first train back to Philadelphia, getting there in time to start the business day about as soon as if he had stayed in New York overnight.

Answers to quiz, page 31

1, Chicago to Oakland, via Santa Fe. 2, Rock Island Lines. 3, Halifax, N. S., to Prince Rupert, B. C., via Canadian National. 4, NYC to Cleveland, Erie to Youngstown, P&LE to Connellsville and WM to Baltimore. 5, CMStP&P. 6, Pacific Great Eastern. 7, Sioux City, Ia. 8, Pennsylvania Railroad from New York to Chicago and Milwaukee Road to Seattle; or NYC from New York to Chicago and Santa Fe to Oakland. 9, (*a*) Milwaukee and Chicago; (*b*) Washington and Baltimore. 10, Boston to Halifax, 731 miles, via B&M, MC, CPR and CN; and Washington to Montreal, 667 miles, via Pennsylvania, New Haven, B&M, CV and CN.

OWN YOUR OWN RAILROAD



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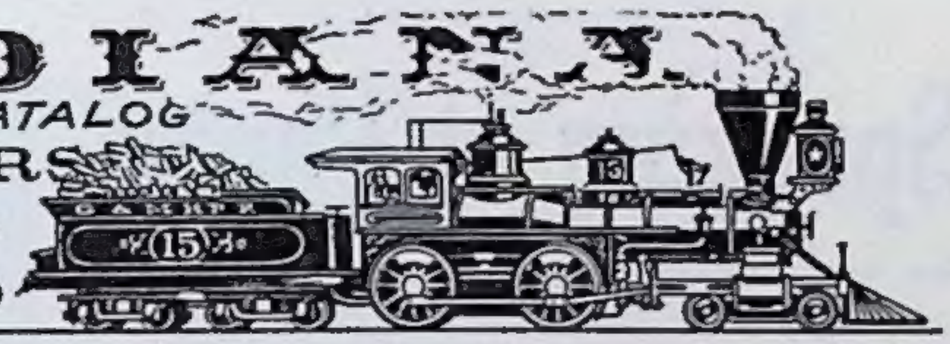

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GRAHAME H. HARDY
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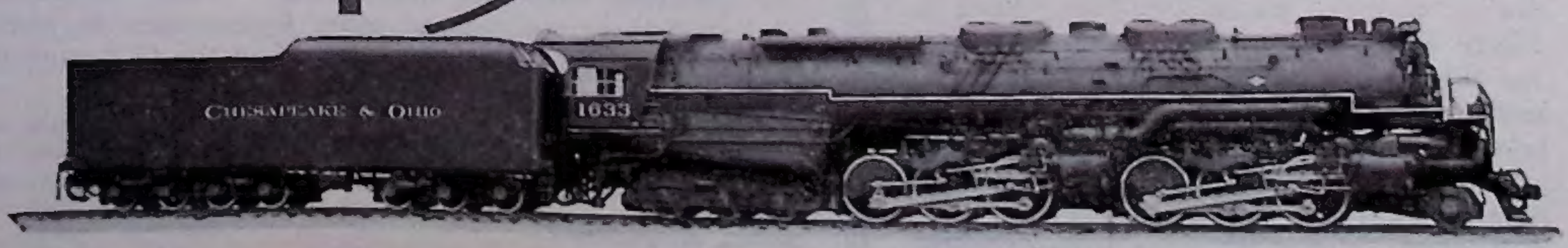
45 ALLEGHENY TYPE LIMAS
now speed C&O traffic



. . . over tough mountain grades

In 1940 the Chesapeake & Ohio ordered ten 2-6-6-6 Super-Power Limas, specially designed to haul heavy trains on tough mountain grades.

So satisfactory did they prove, that the fleet of these powerful, four-cylinder, six-coupled articulated locomotives has been steadily increased until forty-five of them are now speeding C&O traffic over the Alleghenies.

LIMA LOCOMOTIVE WORKS, INC., LIMA, OHIO

Speaking of Photos

As you sit with your feet propped up and the smoke rings from your pipe gently spread in growing circles upon the pages of this March issue of TRAINS we would remind you of a few things which we have mentioned before. 'Tis no point at all-at all to request that you do not travel unnecessarily so we'll refrain from mentioning it.

What we do want to remind you of is this: For a year now TRAINS has been paying an established rate for all photos published. If you haven't received information on this, send a stamp for our Editorial Bulletin No. 2, which contains complete information about photos. Here's a hint or two about sending in photos for consideration. Do not send negatives unless it is absolutely impossible to have prints made. You run a double risk of losing your negatives if you do, first through loss in the mails and secondly through damage on this end in printing them. We cannot be responsible for negatives unsolicited by us. If we ask for them after seeing a contact or enlargement which has been contributed, then of course we assume responsibility for negatives while in our possession. But please hold off until we request negatives.

Now about sending in photographs. Be sure your name and address is written, preferably in light-blue ink (but any ink will do) on the back of each contact or enlargement. It will help considerably if full details concerning the picture are also written on the back of each print. This gives us caption data and enables us to have all the facts at hand when preparing captions. Pasted or scotch-taped slips of paper are not so good. They mark the photos and may get torn off and become lost. If this happens after we've ordered plates, we will have a costly engraving and no caption material for the illustration. We specify that writing on the back of each photo be done in ink because pencil mars the photo and sometimes shows up on the engraver's cut. And here's a tip. When writing in ink on each photo, choose an area corresponding with a dark area on the print. This stops any possibility of the writing showing through under the engraver's light. The light-blue color is another safeguard.

We know it isn't necessary to remind you of the importance of socking your dollars into Bonds. However, just for luck we're going to mention it to you. Another big Bond is another big bomb on the road to victory.

Kalmbach Publishing Co.

1027 N. 7th St. Milwaukee 3, Wis.

Correspondence

Who checked the answers to the quiz in the January issue? The office boy? The *Exposition Flyer* does run on the CB&Q—but also on D&RGW and WP; and while it is just another train in Chicago, it is *the* train on the other two roads. Also, the *Southerner* may have shifted from the Southern to the Missouri Pacific, but I doubt it.

William O. Kessel, 24 W. Cleveland Dr., Buffalo 21, N. Y.

[The *Exposition Flyer* travels farther on the Burlington than on either of the other two roads, but you're right, Mr. Kessel, the others should have been mentioned. Missouri Pacific does have a *Southerner*; so does the Southern Railway.—*Ed.*]

In condensing my article on the Delaware & Hudson [January 1945 TRAINS], some erroneous conclusions were drawn that seriously impair its value. D&H crews with D&H equipment operate over the Napierville Junction Railway, and the NJ Yard in Rouses Point is named for that railroad and not New Jersey. One cannot detrain at Ticonderoga; it is on a two-mile branch which has no passenger service, and the connection to Baldwin at the north end of Lake George was taken up some years ago. The company once operated steamers on both Lake George and Lake Champlain, a total of 140 miles. Transposition of paragraphs has made it seem that Lake Champlain is a mile wide in the vicinity of Schuyler Island, where its width is 10 miles. To revert for a moment to Central Bridge on the Susquehanna Division, that should read Cobleskill, where "trains storm through."

W. T. Coniff, 108 W. 103rd St., New York 25, N. Y.

[We're sorry—all of us but our vice-president-in-charge-of-balling-things-up, who is looking forward to a raise for the good job he did.—*Ed.*]

I was greatly interested in the article on Garratt locomotives [June 1944 TRAINS], especially as far as it concerned the Sudan Railways. The main line of the Sudan Railways runs past my window, only about 30 yards away. The Garratts you mention, however, have now been temporarily taken out of service and are in store at Atbara. Heavy traffic is now worked by a series of 2-8-2 locomotives.

Kenneth Seaward, Khartoum, Sudan.

I read with interest your article [October 1944 TRAINS] concerning the Pennsylvania experiments. Regarding locomotive Q-2, I cannot agree with a statement which is rather ambiguous. The statement referred to is the one regarding the heating surface, and while you do not define the quotation "working speed range" I have checked and find that there are several other locomotives in existence which have a greater heating area than the Q-2, and attach for your information this tabulation.

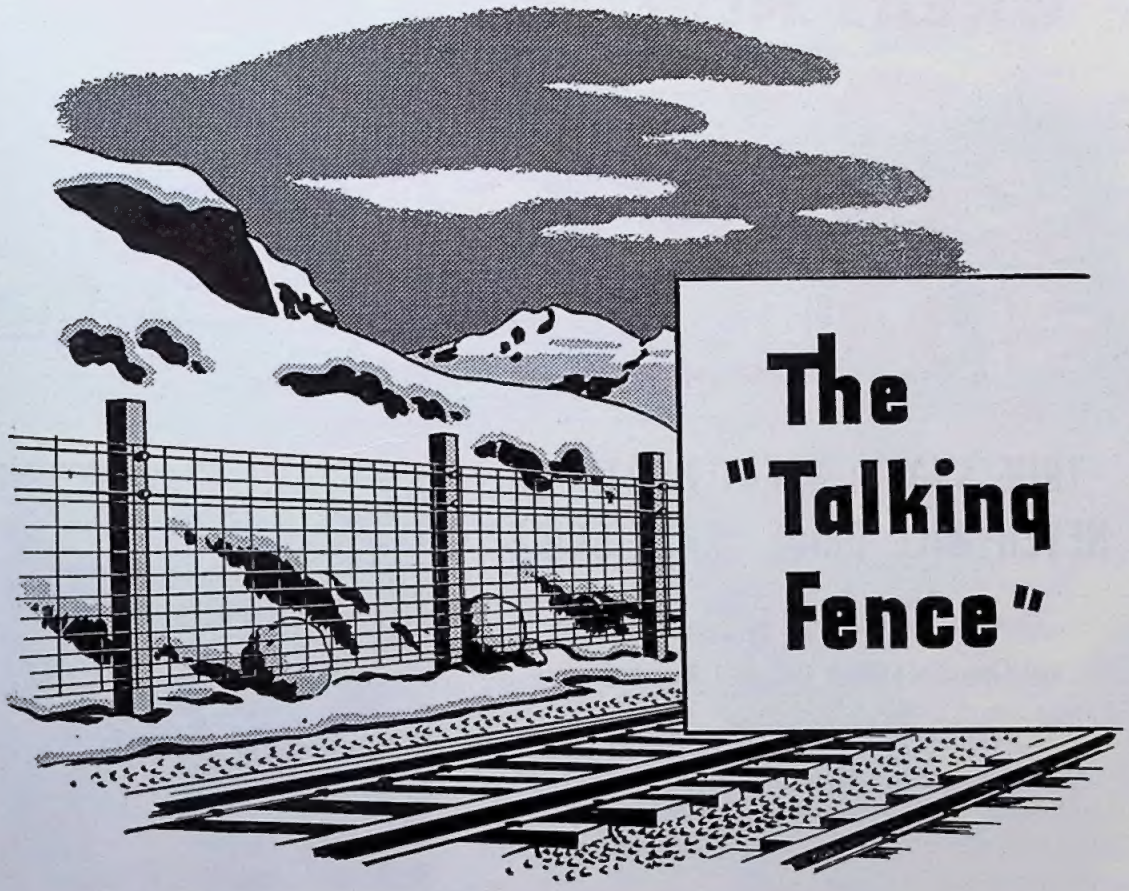
Railroad	Class	Type	Heating Surface* (sq. ft.)	Grate Area (sq. ft.)
Pennsylvania	J-1	2-10-4	9498	121.7
Norfolk & Western	A	2-6-6-4	9342	122.0
Chesapeake & Ohio	H-8	2-6-6-6	10428	135.2
Duluth, Missabe & Iron Range	M-3&4	2-8-8-4	9552	125.0
Southern Pacific	AC-9	2-8-8-4	9749	139.3
Southern Pacific	A-C-10&11	4-8-8-2	9088	139.0
Chesapeake & Ohio	T-1	2-10-4	9665	121.7
Pennsylvania	Q-2	4-4-6-4	9655	121.7
Pennsylvania	S-2	6-8-6†	7042	80.0

* Combined evaporative and superheating surface.
† Steam turbine.

I. E. August, 4747 Broadway, Denver 16, Colo.

Those Canadian roads look like real quality. And CPR meals—*sir!* En route to Ottawa on the morning train from Montreal, I had an order of scrambled eggs and ham that were sheer poetry.

Ralph G. Wood, 24 Etheldridge Rd., White Plains, N. Y.



The "Talking Fence"

You're rolling along through mountainous western country. Suddenly your train stops. Ahead—a signal light has turned red. The "talking fence" has flashed its warning to the engineer.

Technically known as the "slide detector fence," it is erected parallel to Union Pacific tracks as a protection against falling rocks, trees or other possible obstructions. Any such object striking the fence breaks an electrical contact, "setting up" signals miles down the track to warn trains approaching in either direction. A trainman must then make a thorough inspection before trains can proceed.

Union Pacific uses every possible precaution to safeguard its passengers and freight ... troops and war materials ... transported over its Strategic Middle Route uniting the East with the Pacific Coast.

The "talking fence" is but one of the many safety devices developed by our nation's railroads. Such improvements result from enterprise and initiative; characteristic American traits that built the Union Pacific ... that built *Your America*, land of equal opportunity for all.

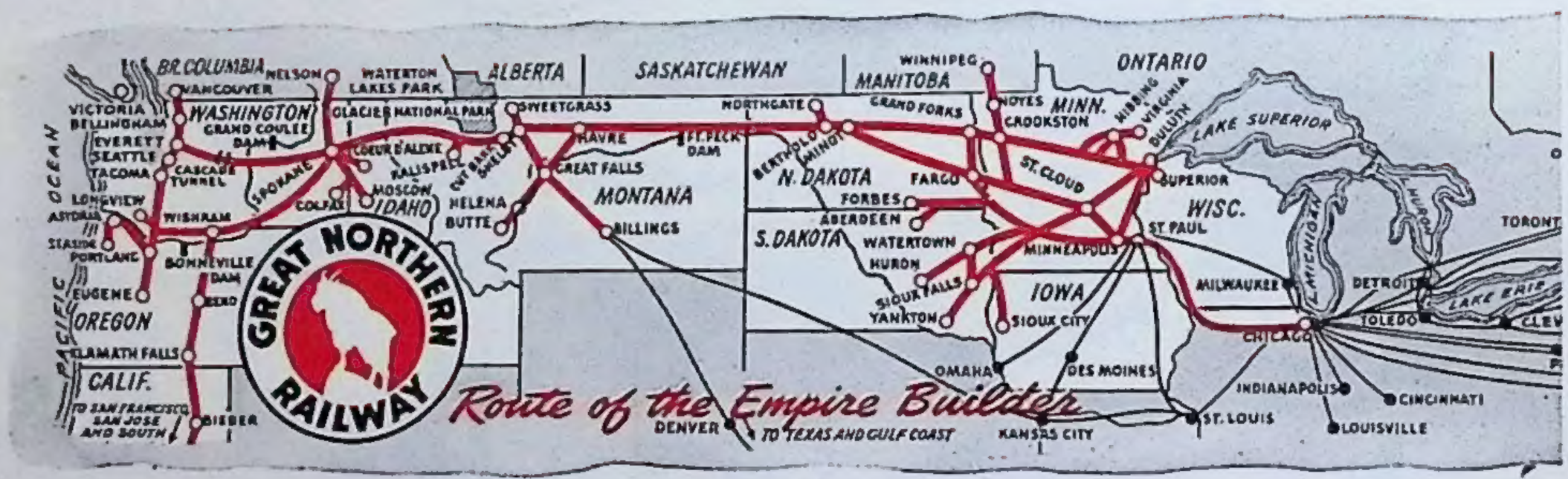
★ *Listen to "YOUR AMERICA" radio program on Mutual nationwide network every Sunday afternoon. Consult your local newspaper for time and station.*

THE PROGRESSIVE

UNION PACIFIC RAILROAD

GREAT NORTHERN RAILWAY

BETWEEN GREAT LAKES AND PACIFIC



TRUE STORY: GREAT NORTHERN NEVER WILL DRIVE "LAST SPIKE"

Continual Improvements of Line, Equipment and Operations Mark Railway's Progressiveness

On January 6, 1893, Great Northern became a transcontinental railway when a line extending eastward from Puget Sound was joined in the Cascade mountains with track pushed westward from the Great Lakes.

The construction crews posed that wintry day for the traditional "last spike" picture. But, actually the job of building and improving the Great Northern never has stopped—in good times and bad!

Great Northern constantly has been improving its roadbed and structures by reducing grades and curves, laying heavier rail, building stronger bridges, boring time-saving tunnels, including the 8-mile Cascade Tunnel, longest in the Western Hemisphere.

Typical of the railway's forward-looking policy is the major track relocation project now under way on Great Northern's main line through the Flathead River canyon, bordering Glacier National Park in the Montana Rockies. Here three tunnels are being blasted through solid rock to eliminate several sharp curves.

A real "last spike" has not been driven on Great Northern—and never will be!

New, heavier rails and tie plates are spiked to chemically treated ties. Maintenance crews give daily attention to roadbed.

Historic "last spike" picture, taken January 6, 1893, when crews spiked rails together, joining GN tracks from the Great Lakes with those from Puget Sound.